ENCYCLOPÆDIA BRITANNICA.

VOLUME the THIRD.

Encyclopædia Britannica;

OR, A

DICTIONARY

OF

ARTS and SCIENCES,

COMPILED UPON A NEW PLAN.

IN WHICH

The different SCIENCES and ARTS are digested into distinct Treatises or Systems;

AND

The various TECHNICAL TERMS, &c. are explained as they occur in the order of the Alphabet.

ILLUSTRATED WITH ONE HUNDRED AND SIXTY COPPERPLATES.

By a SOCIETY *of* GENTLEMEN *in* SCOTLAND.

IN THREE VOLUMES.

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M.DCC.LXXI.

Encyclopædia Britannica;

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ARTS and SCIENCES.

MACAO, an iſland of China, in the province of Canton, fifty miles ſouth of Canton.

Macao, in ornithology. See Psittacus.

MACCABEES, two apocryphal books of ſcripture; ſo called from Judas Mattathias, ſurnamed Maccabeus. The firſt book of the Maccabees is an excellent hiſtory, and comes neareſt to the ſtyle and manner of the ſacred hiſtorians of any extant. It contains the hiſtory of forty years, from the reign of Antiochus Epiphanes to the death of Simon the high prieſt; that is, from the year of the world 3829 to the year 3869, 131 before Chriſt. The ſecond book of the Maccabees begins with two epiſtles ſent from the Jews of Jeruſalem to the Jews of Egypt and Alexandria, to exhort them to obſerve the feaſt of the dedication of the new altar erected by Judas on his purifying the temple. After theſe epiſtles follows the preface of the author to his hiſtory, which is an abridgment of a larger work, compoſed by one Jaſon, a Jew of Cyrene, who wrote the hiſtory of Judas Maccabeus and his brethren, and the wars againſt Antiochus Epiphanes and Eupator his ſon. This ſecond book does not, by any means, equal the accuracy and excellency of the firſt. It contains a hiſtory of about fifteen years, from the execution of Heliodorus's commiſſion, who was ſent by Seleucus to fetch away the treaſures of the temple, to the victory obtained by Judas Maccabeus over Nicanor; that is, from the year of the world 3828, to the year 3843, 147 years before Chriſt.

MACCLESFIELD, a market-town of Cheſhire, thirty-five miles eaſt of Cheſter, from whence the noble family of Parker take the title of earl.

MACE, the ſecond coat or covering of the kernel of the nutmeg, is a thin and membranaceous ſubſtance, of an oleaginous nature and a yellowiſh colour; being met with in flakes of an inch and more in length, which are divided into a multitude of ramifications. It is of an extremely fragrant, aromatic and agreeable flavour, and of a pleaſant, but acrid and oleaginous taſte.

Mace is carminative, ſtomachic, and aſtringent; and poſſeſſes all the virtues of nutmeg, but is leſs aſtringent.

MACEDONIA, a province of European Turky, bounded by Servia and Romania, on the north and eaſt; by the gulphs of Salonichi, Conteſſa and Theſſaly, on the ſouth; and by Albania and Epirus, on the weſt.

MACERATION, is an infuſion of, or ſoaking ingredients in water or any other fluid, in order either to ſoften them, or draw out their virtues.

MACHIAN, a ſmall iſland of the Moluccas, which produces the beſt cloves: it is ſituated under the equator, in 125° E. long. and is ſubject to the Dutch.

MACHINE, in general, whatever hath force ſufficient to raiſe or ſtop the motion of a heavy body. See Mechanics.

MACHINERY, in epic and dramatic poetry, is when the poet introduces the uſe of machines, or brings ſome ſupernatural being upon the ſtage, in order to ſolve ſome difficulty, or to perform ſome exploit out of the reach of human power. See Composition.

MACKERAN, or Mackan, the capital of a province in Perſia of the ſame name; ſituated in E. long. 66°, and N. lat. 26°.

MACKEREL, in ichthyology. See Scomber.

MACROCERCI, a name given to that clafs of animalcules, with tails longer than their bodies.

MACROPYRENIUM, in natural hiftory, a genus of foffils, confifting of cruftated feptariæ, with a long nucleus ftanding out at each end of the mafs.

MACROTELOSTYLA, in natural hiftory, a name of a genus of cryftals, which are compofed of two pyramids, joined to the end of a column; both the pyramids, as alfo the column, being hexangular, and the whole body confequently compofed of eighteen planes.

MACULÆ, in aftronomy, dark fpots appearing on the luminous faces of the fun, moon, and even fome of the planets. See ASTRONOMY.

These fpots are moft numerous and eafily obferved in the fun. It is not uncommon to fee them in various forms, magnitudes, and numbers, moving over the fun's difk. They were firft of all difcovered by the lyncean aftronomer Galileo, in the year 1610, foon after he had finifhed his new-invented telefcope.

MAD APPLE. See SOLANUM.

MADAGASCAR, or *St* LAURENCE, an ifland of Africa, fituated between 43° and 51° of eaft longitude, and between 12° and 26° fouth latitude; three hundred miles fouth-eaft of the continent of Africa. It is about a thoufand miles in length from north to fouth, and generally between two and three hundred miles broad. The country is divided among a great number of petty fovereigns.

MADDER. See RUBIA.

MADERAS, fome iflands fituated in the Atlantic ocean, three hundred miles weft of Sallee, in Africa; in 16° W. long. and between 32° and 33° of N. lat.

The largeft of them, called Madera, or rather Mattera, by the Portuguefe, is about an hundred and twenty miles in circumference, and produces incredible quantities of wine, which has the peculiar quality of keeping beft in hot climates, where other wines turn four.

MADNESS, a moft dreadful kind of delirium, without a fever. See MEDICINE.

MADRAS, a town on the coaft of Cormandel, inhabited by blacks, and fituated juft without the walls of the White town of Fort St George.

MADRE DE POPA, a town and convent of Terra Firma, in South America, fituated on the river Grande, fifty miles eaft of Carthagena, almoft as much reforted to by the pilgrims of America, as the chapel of Loretto is by the pilgrims of Europe: W. long. 76° N. lat. 11°.

MADRID, the capital of the province of New Caftile, and of the whole kingdom of Spain: W. long. 4° 15′, and N. lat. 4° 30′.

MADRIGAL, is a fhort amorous poem, compofed of a number of free and unequal verfes, neither confined to the regularity of a fonnet, nor to the point of an epigram, but only confifting of fome tender and delicate thought, expreffed with a beautiful, noble, and elegant fimplicity

MADRIGAL, in geography, a city of the province of Popayan, in fouth America: W. long. 75° 30′, and N. lat. 30′.

MADURA, the capital of the province of the fame name in the hither India: E. long. 77°, and N. lat. 10°.

MÆMACTERION, the fourth month of the Athenian year, confifting of only twenty-nine days, and anfwering to the latter part of September and the beginning of October.

MÆNA, in ichthyology. See SPARUS.

MAES, a river which arifes in Burgundy, and runs through Lorrain and Champaign into the Netherlands, and at laft, after paffing by many confiderable towns, difcharges itfelf into the German fea, a little below the Briel.

MAESTRICHT, a town in the provine of Brabant, fituated on the river Maes, thirteen miles north of Liege: E. long. 5° 40′, and N. lat. 50° 55′.

MAGADOXA, the capital of the territory of the fame name, at the mouth of the river Magadoxa, on the coaft of Anian, in Africa: E. lon. 41°, and N. lat. 2°.

MAGAZINE, a place in which ftores are kept, of arms, ammunition, provifions, &c. Every fortified town ought to be furnifhed with a large magazine, which fhould contain ftores of all kinds, fufficient to enable the garrifon and inhabitants to hold out a long fiege, and in which fmiths, carpenters, wheelwrights, &c. may be employed, in making every thing belonging to the artillery, as carriages, waggons, &c.

MAGDALEN, or *Nuns of St* MAGDALEN, an order of religious in the Romifh church, dedicated to St Mary Magdalen, and fometimes called Magdalenettes. Thefe chiefly confift of courtezans, who, quitting their profeffion, devote the reft of their lives to repentance and mortification.

MAGDEBURG, the capital of the duchy of the fame name, fituated on the river Elbe, feventy miles weft of Berlin: E. long. 12°, and N lat 52° 15′

MAGDELENA, a large river of South America, which, rifing near the equator, runs north through Terra Firma, and, uniting its waters with the river Cance, obtains the name of the river Grande, and falls into the north fea, below the town of Madre de Popa.

MAGELLAN STREIGHTS, or rather *Streights of* MAGELLAN. Thefe ftreights are about three hundred miles in length from the Atlantic to the Pacific ocean, but of a very unequal breadth; and were at firft difcovered and paffed by Ferdinand Magellan, from whom they had their name: they are fituated between the ifland Terra del Fuego and the moft fouthern part of the continent of America, between 76° and 84° of W. long. and between 52° and 54° of fouth lat.

MAGI, or MAGIANS, an ancient religious fect in Perfia and other eaftern countries, who maintained, that there were two principles, the one the caufe of all good, the other the caufe of all evil; and, abominating the adoration of images, worfhipped God only by fire, which they looked upon as the brighteft and moft glorious fymbol of Oromafdes, or the good God; as darknefs is the trueft fymbol of Arimanius, or the evil god. This religion was reformed by Zoroafter, who maintained that there was one fupreme independent being; and under him two principles or angels, one the angel of

of goodneſs and light, and the other of evil and darkneſs: that there is a perpetual ſtruggle between them, which ſhall laſt to the end of the world; that then the angel of darkneſs and his diſciples ſhall go into a world of their own, where they ſhall be puniſhed in everlaſting darkneſs; and the angel of light and his diſciples ſhall alſo go into a world of their own, where they ſhall be rewarded in everlaſting light.

The prieſts of the magi were the moſt ſkilful mathematicians and philoſophers of the ages in which they lived, inſomuch that a learned man and a magian became equivalent terms. The vulgar looked on their knowledge as more than natural, and imagined them inſpired by ſome ſupernatural power; and hence thoſe who practiſed wicked and miſchievous arts, taking upon themſelves the name of magians, drew on it that ill ſignification which the word magician now bears among us.

This ſect ſtill ſubſiſts in Perſia, under the denomination of gaurs, where they watch the ſacred fire with the greateſt care, and never ſuffer it to be extinguiſhed.

MAGIC, originally ſignified only the knowledge of the more ſublime parts of philoſophy; but as the magi likewiſe profeſſed aſtrology, divination and ſorcery, the term magi became odious, being uſed to ſignify an unlawful diabolical kind of ſcience, acquired by the aſſiſtance of the devil and departed ſouls.

MAGIC LANTERN, in optics. See OPTICS.

MAGISTERY, in chemiſtry, a very fine powder made by ſolution and precipitation.

MAGISTERY *of Biſmuth.* See CHEMISTERY, p. 90. 142.

MAGISTRATE, any public officer to whom the executive power of the law is committed, either wholly or in part.

MAGNA ASSISA ELIGENDA, is a writ anciently directed to the ſheriff for ſummoning four lawful knights before the juſtices of aſſize, in order to chuſe twelve knights of the neighbourhood, *&c.* to paſs upon the great aſſize between ſuch a perſon plaintiff, and ſuch a one defendant.

MAGNA CHARTA, the great charter of the liberties of Britain, and the baſis of our laws and privileges.

This charter may be ſaid to derive its origin from king Edward the Confeſſor, who granted ſeveral privileges to the church and ſtate by charter: theſe liberties and privileges were alſo granted and confirmed by king Henry I. by a celebrated great charter now loſt; but which was confirmed or re-enacted by king Henry II and king John. Henry III, the ſucceſſor of this laſt prince, after having cauſed twelve men to make inquiry into the liberties of England in the reign of Henry I. granted a new charter, which was the ſame as the preſent magna charta: this he ſeveral times confirmed, and as often broke; till, in thirty-ſeventh year of his reign, he went to Weſtminiſter-hall, and there, in the preſence of the nobility and biſhops, who held lighted candles in their hands, magna charta was read, the king all the while holding his hand to his breaſt, and at laſt ſolemnly ſwearing faithfully and inviolably to obſerve all the things therein contained, *&c.* then the biſhops extinguiſhing the candles, and throwing them on the ground, they all cried out, "Thus let him be extinguiſhed, and ſtink in hell, who violates this charter." It is obſerved, that notwithſtanding the ſolemnity of this confirmation, king Henry, the very next year, again invaded the rights of his people, till the barons entered into a war againſt him, when, after various ſucceſs, he confirmed this charter, and the charter of the foreſt, in the fifty ſecond year of his reign. This excellent charter, ſo equitable and beneficial to the ſubject, is the ancienteſt written law in the kingdom: by the 25 Edw. I. it is ordained that it ſhall be taken as the common law; and by the 43 Edward III. all ſtatutes made againſt it are declared to be void.

MAGNESIA. See CHEMISTRY, p. 119.

MAGNET, or LOADSTONE, in natural hiſtory, a very rich iron ore, found in large detached maſſes, of a duſky iron-grey, often tinged with browniſh or reddiſh, and when broken appearing ſomething like the common emery, but leſs ſparkling. It is very heavy, conſiderably hard, of a perfectly irregular and uneven ſurface, and of a firm ſtructure, but uſually with ſome porous irregularities within. It is found in Britain, and all other places where there are iron mines. See MECHANICS.

MAGNIFYING, the making of objects appear larger than they would otherwiſe do; whence convex lenſes, which have the power of doing this, are called magnifying glaſſes. See OPTICS.

MAGNITUDE, whatever is made up of parts locally extended, or that hath ſeveral dimenſions; as a line, ſurface, ſolid, *&c.*

MAGNOLIA, in botany, a genus of the polyandria polygynia claſs. The calix conſiſts of three leaves, and the corolla of nine petals; the capſules are imbricated, and have two valves; and the ſeed is a pendulous berry. There are four ſpecies, all natives of America.

MAGPY, in ornithology. See CORVUS.

MAHOMETANS, thoſe who believe in the religion and divine miſſion of Mahomet, or Mohammed.

It will not be improper here to give a general account of this extraordinary perſon, and the religion which he had the addreſs to propagate over moſt of the eaſtern nations.

Mohammed was born in the reign of Anuſhirwan the Juſt, emperor of Perſia, about the end of the 6th century of the Chriſtian æra. He came into the world under ſome diſadvantages. His father Abd'allah was a younger ſon of Abd'almotalleb, and, dying very young, and in his father's life time, left his widow and infant ſon in very mean circumſtances, his whole ſubſtance conſiſting but of five camels and one Ethiopian ſheſlave. Abd'almotalleb was therefore obliged to take care of his grandchild Mohammed, which he not only did during his life, but at his death enjoined his eldeſt ſon Abu Taleb, who was brother to Abd'allah by the ſame mother, to provide for him for the future; which he very affectionately did, and inſtructed him in the buſineſs of a merchant which he followed; and to that end he took him into Syria when he was but thirteen,

and afterwards recommended him to Khadijah, a noble and rich widow, for her factor; in whose service he behaved himself so well, that by making him her husband she soon raised him to an equality with the richest in Mecca.

After he began by this advantageous match to live at his ease, it was that he formed the scheme of establishing a new religion, or, as he expressed it, of replanting the only true and ancient one, professed by Adam, Noah, Abraham, Moses, Jesus, and all the prophets, by destroying the gross idolatry into which the generality of his countrymen had fallen, and weeding out the corruptions and superstitions which the latter Jews and Christians had, as he thought, introduced into their religion, and reducing it to its original purity, which consisted chiefly in the worship of one only God.

Before he made any attempt abroad, he rightly judged that it was necessary for him to begin with the conversion of his own household. Having therefore retired with his family, as he had done several times before, to a cave in mount *Hara*, he there opened the secret of his mission to his wife Khadijah; and acquainted her that the angel Gabriel had just before appeared to him, and told him that he was appointed the apostle of God: he also repeated to her a passage which he pretended had been revealed to him by the ministry of the angel, with those other circumstances of this first appearance, which are related by the Mohammedan writers. Khadijah received the news with great joy; swearing by him in whose hands her soul was, that she trusted he would be the prophet of his nation; and immediately communicated what she had heard to her cousin Warakah Ebn Nawfal, who, being a Christian, could write in the Hebrew character, and was tolerably well versed in the scriptures; and he as readily came into her opinion, assuring her that the same angel who had formerly appeared unto Moses was now sent to Mohammed. The first overture the prophet made in the month of Ramadan, in the fortieth year of his age, which is therefore usually called the year of his mission.

Encouraged by so good a beginning, he resolved to proceed, and try for some time what he could do by private persuasion, not daring to hazard the whole affair by exposing it too suddenly to the public. He soon made proselytes of those under his own roof, *viz.* his wife Khadijah, his servant Zeid Ebn Haretha (to whom he gave his freedom on that occasion, which afterwards became a rule to his followers) and his cousin and pupil Ali, the son of Abu Taleb, though then very young: but this last, making no account of the other two, used to style himself the *first of believers*. The next person Mohammed applied to was Abd'allah Ebn Abi Kohafa, surnamed Abu Becr, a man of great authority among the Koreish, and one whose interest he well knew would be of great service to him; as it soon appeared: for Abu Becr, being gained over, prevailed also on Othman Ebn Affan, Abd'alraham Ebn Awf, Saad Ebn Abi Wakkas, al Zobeir Ebn al Awam, and Telha Ebn Obeid'allah, all principal men of Mecca, to follow his example. These men were the six chief companions, who, with a few more, were converted in the space of three years; at the end of which, Mohammed having, as he hoped, a sufficient interest to support him, made his mission no longer a secret, but gave out that God had commanded him to admonish his near relations, and, in order to do it with more convenience and prospect of success, he directed Ali to prepare an entertainment, and invite the sons and descendants of Abd'almotalleb, intending then to open his mind to them: this was done, and about forty of them came; but Abu Laheb, one of his uncles, making the company break up before Mohammed had an opportunity of speaking, obliged him to give them a second invitation the next day; and when they were come, he made them the following speech: "I know no man in all Arabia who can offer his kindred a more excellent thing than I now do you: I offer you happiness both in this life, and in that which is to come; God Almighty hath commanded me to call you unto him; Who therefore among you will be assistant to me herein, and become my brother and my vicegerent?" All of them hesitating, and declining the matter, Ali at length rose up, and declared that he would be his assistant; and vehemently threatened those who should oppose him. Mohammed upon this embraced Ali with great demonstrations of affection, and desired all who were present to hearken to and obey him, as his deputy; at which the company broke out into a great laughter, telling Abu Taleb that he must now pay obedience to his son.

This repulse however was so far from discouraging Mohammed, that he began to preach in public to the people, who heard him with some patience, till he came to upbraid them with the idolatry, obstinacy, and perverseness of themselves and their fathers; which so highly provoked them, that they declared themselves his enemies, and would soon have procured his ruin, had he not been protected by Abu Taleb. The chief of the Koreish warmly solicited this person to desert his nephew, making frequent remonstrances against the innovations he was attempting; which proving ineffectual, they at length threatened him with an open rupture, if he did not prevail on Mohammed to desist. At this Abu Taleb was so far moved, that he earnestly dissuaded his nephew from pursuing the affair any farther, representing the great danger he and his friends must otherwise run. But Mohammed was not to be intimidated, telling his uncle plainly, *that if they set the sun against him on his right hand, and the moon on his left, he would not leave his enterprize*: and Abu Taleb, seeing him so firmly resolved to proceed, used no further argnments, but promised to stand by him against all his enemies.

The Koreish, finding they could prevail neither by fair words nor menaces, tried what they could do by force and ill treatment; using Mohammed's followers so very injuriously, that it was not safe for them to continue at Mecca any longer; whereupon Mohammed gave leave to such of them as had not friends to protect them to seek for refuge elsewhere. And accordingly, in the fifth year of the prophet's mission, sixteen of them, four of whom were women, fled into Ethiopia; and among them Othman Ebn Affan and his wife Rakiah, Mohammed's daughter. This was the first flight; but afterwards several others followed them, retiring one after another, to the number of eighty-three men and eighteen women, besides

besides children. These refugees were kindly received by the Najashi, or king of Ethiopia, who refused to deliver them up to those whom the Koreish sent to demand them, and, as the Arab writers unanimously attest, even professed the Mohammedan religion.

In the sixth year of his mission Mohammed had the pleasure of seeing his party strengthened by the conversion of his uncle Hamza, a man of great valour and merit, and of Omar Ebn al Khattab, a person highly esteemed, and once a violent opposer of the prophet. As persecution generally advances rather than obstructs the spreading of a religion, Islamism made so great a progress among the Arab tribes, that the Koreish, to suppress it effectually, if possible, in the seventh year of Mohammed's mission, made a solemn league or covenant against the Hashemites and the family of Abd'almotalleb, engaging themselves to contract no marriages with any of them, and to have no communication with them; and, to give it the greater sanction, reduced it into writing, and laid it up in the Caaba. Upon this the tribe became divided into two factions; and the family of Hashem all repaired to Abu Taleb, as their head; except only Abd'al Uzza, surnamed Abu Laheb, who, out of his inveterate hatred to his nephew and his doctrine, went over to the opposite party, whose chief was Abu Sofian Ebn Harb, of the family of Ommeya.

The families continued thus at variance for three years; but, in the tenth year of his mission, Mohammed told his uncle Abu Taleb, that God had manifestly shewed his disapprobation of the league which the Koreish had made against them, by sending a worm to eat out every word of the instrument, except the name of God. Of this accident Mohammed had probably some private notice; for Abu Taleb went immediately to the Koreish and acquainted them with it; offering, if it proved false, to deliver his nephew up to them; but, in case it were true, he insisted that they ought to lay aside their animosity, and annul the league they had made against the Hashemites. To this they acquiesced, and, going to inspect the writing, to their great astonishment found it to be as Abu Taleb had said; and the league was thereupon declared void.

In the same year Abu Taleb died, at the age of above fourscore; and it is the general opinion that he died an infidel; though others say, that when he was at the point of death he embraced Mohammedism, and produce some passages out of his poetical compositions to confirm their assertion. About a month, or, as some write, three days after the death of this great benefactor and patron, Mohammed had the additional mortification to lose his wife Khadijah, who had so generously made his fortune. For which reason this year is called the *year* of *mourning*.

On the death of these two persons the Koreish began to be more troublesome than ever to their prophet, and especially some who had formerly been his intimate friends; insomuch that he found himself obliged to seek for shelter elsewhere, and first pitched upon Tayef, about sixty miles east from Mecca, for the place for his retreat. Thither therefore he went, accompanied by his servant Zied, and applied himself to two of the chief of the tribe of Thakif who were the inhabitants of that place; but they received them very coldly. However, he staid there a month; and some of the more considerate and better sort of men treated him with a little respect: but the slaves and inferior people at length rose against him, and, bringing him to the wall of the city, obliged him to depart, and return to Mecca; where he put himself under the protection of al Motaam Ebn Adi.

This repulse greatly discouraged his followers: however, Mohammed was not wanting to himself, but boldly continued to preach to the public assemblies at the pilgrimage, and gained several proselytes, and among them six of the inhabitants of Yathreb of the Jewish tribe of Khazraj, who, on their return home, failed not to speak much in commendation of their new religion, and exhorted their fellow-citizens to embrace the same.

In the twelfth year of his mission it was that Mohammed gave out that he had made his night journey from Mecca to Jerusalem, and thence to heaven, so much spoken of by all that write of him. Dr Prideaux thinks he invented it, either to answer the expectations of those who demanded some miracle as a proof of his mission; or else, by pretending to have conversed with God, to establish the authority of whatever he should think fit to leave behind by way of oral tradition, and make his sayings to serve the same purpose as the oral law of the Jews. But it does not appear that Mohammed himself ever expected so great a regard should be paid to his sayings, as his followers have since done; and seeing he all along disclaimed any power of performing miracles, it seems rather to have been a fetch of policy to raise his reputation, by pretending to have actually conversed with God in heaven, as Moses had heretofore done in the mount, and to have received several institutions immediately from him, whereas before he contented himself with persuading them that he had all by the ministry of Gabriel.

However, this story seemed so absurd and incredible, that several of his followers left him upon it; and had probably ruined the whole design, had not Abu Becr vouched for his veracity, and declared that, if Mohammed affirmed it to be true, he verily believed the whole. Which happy incident not only retrieved the prophet's credit, but increased it to such a degree, that he was secure of being able to make his disciples swallow whatever he pleased to impose on them for the future. And this fiction, notwithstanding its extravagance, was one of the most artful contrivances Mohammed ever put in practice, and what chiefly contributed to the raising of his reputation to that great height to which it afterwards arrived.

In this year, called by the Mohammedans the *accepted year*, twelve men of Yathreb or Medina, of whom ten were of the tribe of Khazraj, and the other two of that of Aws, came to Mecca, and took an oath of fidelity to Mohammed at al Akaba, a hill on the north of that city. This oath was called *the womens oath*; not that any women were present at this time, but because a man was not thereby obliged to take up arms in defence of Mohammed or his religion; it being the same oath that was afterwards exacted of the women, the form of which we have in the Koran, and is to this effect; *viz.* That they should renounce all idolatry; and they should not steal, nor commit fornication, nor kill their children (as the Pagan

Pagan Arabs uſed to do when they apprehended they ſhould not be able to maintain them,) nor forge calumnies; and that they ſhould obey the prophet in all things that were reaſonable. When they had ſolemnly engaged to all this, Mohammed ſent one of his diſciples, named Maſab Ebn Omair, home with them, to inſtruct them more fully in the grounds and ceremonies of his new religion

Maſab being arrived at Medina, by the aſſiſtance of thoſe who had been formerly converted, gained ſeveral proſelytes, particularly Oſaid Ebn Hodeira, a chief man of the city, and Saad Ebn Moadh, prince of the tribe of Aws; Mohammediſm ſpreading ſo faſt, that there was ſcarce a houſe wherein there were not ſome who had embraced it.

The next year, being the thirteenth of Mohammed's miſſion, Maſab returned to Mecca, accompanied by ſeventy-three men and two women of Medina who had profeſſed Iſlamiſm, beſides ſome others who were as yet unbelievers. On their arrival, they immediately ſent to Mohammed, and offered him their aſſiſtance, of which he was now in great need; for his adverſaries were by this time grown ſo powerful in Mecca, that he could not ſtay there much longer without imminent danger. Wherefore he accepted their propoſal, and met them one night, by appointment, at al Akaba above-mentioned, attended by his uncle al Abbas, who, though he was not then a believer, wiſhed his nephew well, and made a ſpeech to thoſe of Medina, wherein he told them, that as Mohammed was obliged to quit his native city, and ſeek an aſylum elſewhere, and they had offered him their protection, they would do well not to deceive him; that if they were not firmly reſolved to defend, and not betray him, they had better declare their minds, and let him provide for his ſafety in ſome other manner. Upon their proteſting their ſincerity, Mohammed ſwore to be faithful to them, on condition that they ſhould protect him againſt all inſults, as heartily as they would their own wives and families. They then aſked him what recompence they were to expect if they ſhould happen to be killed in his quarrel; he anſwered, paradiſe. Whereupon they pledged their faith to him, and ſo returned home; after Mohammed had choſen twelve out of their number, who were to have the ſame authority among them as the twelve apoſtles of Chriſt had among his diſciples.

Hitherto Mohammed had propagated his religion by fair means, ſo that the whole ſucceſs of his enterprize, before his flight to Medina, muſt be atributed to perſuaſion only, and not to compulſion. For before this ſecond oath of fealty or inauguration at al Akaba, he had no permiſſion to uſe any force at all; and in ſeveral places of the Koran, which he pretended were revealed during his ſtay at Mecca, he declares his buſineſs was only to preach and admoniſh; that he had no authority to compel any perſon to embrace his religion; and that, whether people believe or not, was none of his concern, but belonged ſolely unto God. And he was ſo far from allowing his followers to uſe force, that he exhorted them to bear patiently thoſe injuries which were offered them on account of their faith; and, when perſecuted himſelf, choſe rather to quit the place of his birth and retire to Medina, than to make any reſiſtance. But this great paſſiveneſs and moderation ſeem entirely owing to his want of power, and the great ſuperiority of his oppoſers for the firſt twelve years of his miſſion; for no ſooner was he enabled, by the aſſiſtance of thoſe of Medina, to make head againſt his enemies, than he gave out, that God had allowed him and his followers to defend themſelves againſt the infidels; and at length, as his forces increaſed, he pretended to have the divine leave even to attack them; and to deſtroy idolatry, and ſet up the true faith by the ſword; finding, by experience, that his deſigns would otherwiſe proceed very ſlowly, if they were not utterly overthrown; and knowing, on the other hand, that innovators, when they depend ſolely on their own ſtrength, and can compel, ſeldom run any riſque; from whence, ſays Machiavel, it follows, that all the armed prophets have ſucceeded, and the unarmed ones have failed. Moſes, Cyrus, Theſeus, and Romulus, would not have been able to eſtabliſh the obſervance of their inſtitutions for any length of time, had they not been armed. The firſt paſſage of the Koran which gave Mohammed the permiſſion of defending himſelf by arms, is ſaid to have been that in the twenty-ſecond chapter; after which a great number to the ſame purpoſe were revealed.

That Mohammed had a right to take up arms for his own defence againſt his unjuſt perſecutors, may, perhaps, be allowed; but whether he ought afterwards to have made uſe of that means for the eſtabliſhing of his religion, is not ſo eaſy to determine. How far the ſecular power may or ought to interpoſe in affairs of this nature, mankind are not agreed. The method of converting by the ſword gives no very favourable idea of the faith which is ſo propagated, and is diſallowed by every body in thoſe of another religion, though the ſame perſons are willing to admit of it for the advancement of their own; ſuppoſing that, though a falſe religion ought not to be eſtabliſhed by authority, yet a true one may; and accordingly force is almoſt as conſtantly employed in theſe caſes by thoſe who have the power in their hands, as it is conſtantly complained of by thoſe who ſuffer the violence. It is certainly one of the moſt convincing proofs that Mohammediſm was no other than a human invention, that it owed its progreſs and eſtabliſhment almoſt entirely to the ſword; and it is one of the ſtrongeſt demonſtrations of the divine original of Chriſtianity, that it prevailed againſt all the force and powers of the world by the mere dint of its own truth, after having ſtood the aſſaults of all manner of perſecutions, as well as other oppoſitions, for three hundred years together, and at length made the Roman emperors themſelves ſubmit thereto; after which time, indeed, this proof ſeems to fail, Chriſtianity being then eſtabliſhed, and Paganiſm aboliſhed, by public authority, which has had great influence in the propagation of the one and deſtruction of the other ever ſince. But to return:

Mohammed, having provided for the ſecurity of his companions as well as his own, by the league offenſive and defenſive which he had now concluded with thoſe of Medina, directed them to repair thither, which they accordingly did; but himſelf with Abu Becr and Ali ſtaid behind, having not yet received the divine permiſſion, as he

he pretended, to leave Mecca, The Koreish, fearing the consequence of this new alliance, began to think it absolutely necessary to prevent Mohammed's escape to Medina; and having held a council thereon, after several milder expedients had been rejected, they came to a resolution that he should be killed; and agreed that a man should be chosen out of every tribe for the execution of this design; and that each man should have a blow at him with his sword, that the guilt of his blood might fall equally on all the tribes, to whose united power the Hashemites were much inferior, and therefore durst not attempt to revenge their kinsman's death.

This conspiracy was scarce formed, when, by some means or other, it came to Mohammed's knowledge; and he gave out that it was revealed to him by the angel Gabriel, who had now ordered him to retire to Medina. Whereupon, to amuse his enemies, he directed Ali to lie down in his place, and wrap himself up in his green cloak, which he did; and Mohammed escaped miraculously, as they pretend, to Abu Becr's house, unperceived by the conspirators, who had already assembled at the prophet's door. They, in the mean time, looking through the crevice, and seeing Ali, whom they took to be Mohammed himself, asleep, continued watching there till morning, when Ali arose, and they found themselves deceived.

From Abu Becr's house Mohammed and he went to a cave in mount Thur, to the south-east of Mecca, accompanied only by Amer Ebn Foheirah, Abu Becr's servant, and Abd'allah Ebn Oreitah, an idolater whom they had hired for a guide. In this cave they lay hid three days, to avoid the search of their enemies; which they very narrowly escaped, and not without the assistance of more miracles than one: for some say that the Koreish were struck with blindness, so that they could not find the cave; others, that after Mohammed and his companions were got in, two pigeons laid their eggs at the entrance, and a spider covered the mouth of the cave with her web, which made them look no farther. Abu Becr, seeing the prophet in such imminent danger, became very sorrowful; whereupon Mohammed comforted him with these words, recorded in the Koran, *Be not grieved, for God is with us.* Their enemies being retired, they left the cave, and set out for Medina, by a by road; and having fortunately, or, as the Mohammedans tell us, miraculously escaped some who were sent to pursue them, arrived safely at that city; whither Ali followed them in three days, after he had settled some affairs at Mecca.

The first thing Mohammed did after his arrival at Medina, was to build a temple for his religious worship, and a house for himself, which he did on a parcel of ground which had before served to put camels in, or, as others tell us, for a burying-ground and belonged to Sahal and Soheil the sons of Amru, who were orphans. This action Dr Prideaux exclaims against, representing it as a flagrant instance of injustice; for that, says he, he violently dispossessed these poor orphans, the sons of an inferior artificer (whom the author he quotes calls a carpenter) of this ground, and so founded the first fabric of his worship with the like wickedness as he did his religion. But, to say nothing of the improbability that Mohammed should act in so impolitic a manner at his first coming, the Mohammedan writers set this affair in a quite different light: one tells us that he treated with the lads about the price of the ground, but they desired he would accept it as a present: however, as historians of good credit assure us, he actually bought it; and the money was paid by Abu Becr. Besides, had Mohammed accepted it as a present, the orphans were in circumstances sufficient to have afforded it; for they were of a very good family, of the tribe of Najjar, one of the most illustrious among the Arabs, and not the sons of a carpenter, as Dr Prideaux's author writes, who took the word Najjar, which signifies a carpenter, for an appellative, whereas it is a proper name.

Mohammed, being securely settled at Medina, and able not only to defend himself against the insults of his enemies, but to attack them, began to send out small parties to make reprisals on the Koreish; the first party consisting of no more than nine men, who intercepted and plundered a caravan belonging to that tribe, and in the action took two prisoners. But what established his affairs very much, and was the foundation on which he built all his succeeding greatness, was the gaining of the battle of Bedr, which was fought in the second year of the Hejra, and is so famous in the Mohammedan history. Some reckon no less than twenty-seven expeditions wherein Mohammed was personally present, in nine of which he gave battle, besides several other expeditions in which he was not present. His forces he maintained partly by the contributions of his followers for this purpose, which he called by the name of zacat or alms, and the paying of which he very artfully made one main article of his religion; and partly by ordering a fifth part of the plunder to be brought into the public treasury for that purpose, in which matter he likewise pretended to act by the divine direction.

In a few years by the success of his arms (notwithstanding he sometimes came off by the worst) he considerably raised his credit and power. In the sixth year of the Hejra he set out with 1400 men to visit the temple of Mecca, not with any intent of committing hostilities, but in a peaceable manner. However, when he came to al Hodeibiya, which is situate partly within and partly without the sacred territory, the Koreish sent to let him know that they would not permit him to enter Mecca, unless he forced his way; whereupon he called his troops about him and they all took a solemn oath of fealty or homage to him, and he resolved to attack the city; but those of Mecca sending Arwa Ebn Masud, prince of the tribe of Thakif, as their ambassador, to desire peace, a truce was concluded between them for ten years, by which any person was allowed to enter into league either with Mohammed, or with the Koreish, as he thought fit.

It may not be improper to shew the inconceivable veneration and respect the Mohammedans by this time had for their prophet, to mention the account which the above-mentioned ambassador gave the Koreish, at his return of their behaviour. He said he had been at the courts both of the Roman emperor and of the king of Persia, and never saw any prince so highly respected by his subjects as Mohammed was by his companions; for, whenever he made the ablution, in order to say his prayers, they ran and catched the water that he had used; and, whenever he spit, they immediately licked it up, and gathered

ed up every hair that fell from him with great ſuperſtition.

In the ſeventh year of the Hejra, Mohammed began to think of propagating his religion beyond the bounds of Arabia, and ſent meſſengers to the neighbouring princes, with letters to invite them to Mohammediſm. Nor was this project without ſome ſucceſs. Khoſru Parviz, then king of Perſia, received his letter with great diſdain, and tore it in a paſſion, ſending away the meſſenger very abruptly; which when Mohammed heard, he ſaid, *God ſhall tear his kingdom.* And ſoon after a meſſenger came to Mohammed from Badhan king of Yaman, who was a dependent on the Perſians, to acquaint him that he had received orders to ſend him to Khoſru. Mohammed put off his anſwer till the next morning, and then told the meſſenger it had been revealed to him that night that Khoſru was ſlain by his ſon Shiruyeh; adding, that he was well aſſured his new religion and empire ſhould riſe to as great a height as that of Khoſru; and therefore bid him adviſe his maſter to embrace Mohammediſm. The meſſenger being returned, Badhan in a few days received a letter from Shiruyeh, informing him of his father's death, and ordering him to give the prophet no further diſturbance. Whereupon Badhan and the Perſians with him turned Mohammedans.

The emperor Heraclius, as the Arabian hiſtorians aſſure us, received Mohammed's letter with great reſpect, laying it on his pillow, and diſmiſſed the bearer honourably. And ſome pretend that he would have profeſſed this new faith, had he not been afraid of loſing his crown.

Mohammed wrote to the ſame effect to the king of Ethiopia, though he had been converted before, according to the Arab writers; and to Mokawkas, governor of Egypt, who gave the meſſenger a very favourable reception, and ſent ſeveral valuable preſents to Mohammed, and among the reſt two girls, one of which, named Mary, became a great favourite with him. He alſo ſent letters of the like purport to ſeveral Arab princes; particularly one to al Hareth Ebn Abi Shamer king of Ghaſſean, who returning for anſwer that he would go to Mohammed himſelf, the prophet ſaid, *May his kingdom periſh;* another to Hawdha Ebn Ali, king of Yamama, who was a Chriſtian, and, having ſome time before profeſſed Iſlamiſm, had lately returned to his former faith; this prince ſent back a very rough anſwer, upon which Mohammed curſing him, he died ſoon after; and a third to al Mondar Ebn Sawa, king of Bahrein, who embraced Mohammediſm, and all the Arabs of that country followed his example.

The eighth year of the Hejra was a very fortunate year to Mohammed. In the beginning of it, Khaled Ebn al Walid and Amru Ebn al As, both excellent ſoldiers, the firſt of whom afterwards conquered Syria and other countries, and the latter Egypt, became proſelytes of Mohammediſm. And ſoon after the prophet ſent 3000 men againſt the Grecian forces, to revenge the death of one of his ambaſſadors, who being ſent to the governor of Boſra on the ſame errand as thoſe who went to the abovementioned princes, were ſlain by an Arab, of the tribe of Ghaſſan, at Muta, a town in the territory of Balka in Syria, about three days journey eaſtward from Jeruſalem, near which town they encountered. The Grecians being vaſtly ſuperior in number (for, including the auxiliary Arabs, they had an army of 100,000 men) the Mohammedans were repulſed in the firſt attack, and loſt ſucceſſively three of their generals, viz. Zeid Ebn Haretha Mohammed's freedman, Jaafar the ſon of Abu Taleb, and Abdallah Ebn Rawaha; but Khaled Ebn al Walid, ſucceeding to the command, overthrew the Greeks with a great ſlaughter, and brought away abundance of rich ſpoil; on occaſion of which action Mohammed gave him the honourable title of Seif min ſoyuf Allah, *one of the ſwords of* GOD.

In this year alſo Mohammed took the city of Mecca, the inhabitants whereof had broken the truce concluded on two years before. For the tribe of Becr, who were confederates with the Koreiſh, attacking thoſe of Khozaah, who were allies of Mohammed, killed ſeveral of them, being ſupported in the action by a party of the Koreiſh themſelves. The conſequence of this violation was ſoon apprehended; and Abu Sofian himſelf made a journey to Medina on purpoſe to heal the breach and renew the truce; but in vain: for Mohammed, glad of this opportunity, refuſed to ſee him: whereupon he applied to Abu Becr and Ali; but they giving him no anſwer, he was obliged to return to Mecca as he came.

Mohammed immediately gave orders for preparations to be made, that he might ſurpriſe the Meccans while they were unprovided to receive him: in a little time he began his march thither, and by that time he came near the city his forces were increaſed to 10,000 men. Thoſe of Mecca, being not in a condition to defend themſelves againſt ſo formidable an army, ſurrendered at diſcretion; and Abu Sofian ſaved his life by turning Mohammedan. About twenty-eight of the idolaters were killed by a party under the command of Khaled; but this happened contrary to Mohammed's orders, who, when he entered the town, pardoned all the Koreiſh, on their ſubmiſſion, except only ſix men and four women, who were more obnoxious than ordinary (ſome of them having apoſtatiſed) and were ſolemnly proſcribed by the prophet himſelf; but of theſe no more than three men and one woman were put to death, the reſt obtaining pardon on their embracing Mohammediſm, and one of the women making her eſcape.

The remainder of this year Mohammed employed in deſtroying the idols in and round Mecca, ſending ſeveral of his generals on expeditions for that purpoſe, and to invite the Arabs to Iſlamiſm; wherein it is no wonder if they now met with ſucceſs.

The next year, being the ninth of the Hejra, the Mohammedans call *the year of embaſſies:* for the Arabs had been hitherto expecting the iſſue of the war between Mohammed and the Koreiſh; but, ſo ſoon as that tribe, the principal of the whole nation, and the genuine deſcendants of Iſhmael, whoſe prerogatives none offered to diſpute, had ſubmitted, they were ſatisfied that it was not in their power to oppoſe Mohammed, and therefore began to come in to him in great numbers, and to ſend embaſſies to make their ſubmiſſions to him, both to Mecca, while he ſtaid there, and alſo to Medina, whither he returned this year. Among the reſt; five kings of the tribe of Hamyar profeſſed Mohammediſm, and ſent ambaſſadors to notify the ſame.

In the tenth year Ali was ſent into Yaman to propagate the Mohammedan faith there, and, as it is ſaid, converted the whole tribe of Hamdan in one day. Their example was quickly followed by all the inhabitants of that province, except only thoſe of Najran, who, being Chriſtians, choſe rather to pay tribute.

Thus was Mohammediſm eſtabliſhed, and idolatry rooted out, even in Mohammed's life-time (for he died the next year) throughout all Arabia, except only Yamama, where Moſeilama, who ſet up alſo for a prophet as Mohammed's competitor, had a great party, and was not reduced till the Khalifat of Abu Becr: and the Arabs, being then united in one faith and under one prince, found themſelves in a condition of making thoſe conqueſts, which extended the Mohammedan faith over ſo great a part of the world.

Of the Koran. The word *Koran*, derived from the verb karaa, *to read*, ſignifies properly, in Arabic, *the reading*, or, rather, *that which ought to be read;* by which name the Mohammedans denote not only the entire book or volume of the Koran, but alſo any particular chapter or ſection of it; juſt as the Jews call either the whole ſcripture, or any part of it, by the name of Karah, or Mikra, words of the ſame origin and import. See ALCORAN.

Beſide this peculiar name, the Koran is alſo honoured with ſeveral appellations, common to other books of ſcripture: as, *al Farkan*, from the verb *foraka, to divide or diſtinguiſh*; not, as the Mohammedan doctors ſay, becauſe thoſe books are divided into chapters or ſections, or diſtinguiſh between good and evil; but in the ſame notion that the Jews uſe the word Perek, or Pirka, from the ſame root, to denote a ſection or portion of ſcripture. It is alſo called al Moſhaf, *the volume*, and all Kitab, *the book*, by way of eminence, which anſwers to the *Biblia* of the Greeks; and al Dhikr, *the admonition*, which name is alſo given to the Pentateuch and Goſpel.

The Koran is divided into 114 larger portions of very unequal length, which we call *chapters*, but the Arabians *Sowar*, in the ſingular *Sura*, a word rarely uſed on any other occaſion, and properly ſignifying a row, order, or a regular ſeries; as a courſe of bricks in building, or a rank of ſoldiers in an army; and is the ſame in uſe and import with the Sura, or Tora of the Jews, who alſo call the fifty-three ſections of the Pentateuch Sedarim, a word of the ſame ſignification.

Theſe chapters are not in the manuſcript copies diſtinguiſhed by their numerical order, but by particular titles, which are taken ſometimes from a particular matter treated of, or perſon mentioned therein; but uſually from the firſt word of note, exactly in the ſame manner as the Jews have named their Sedarim; though the word from which ſome chapters are denominated be very far diſtant, towards the middle, or perhaps the end of the chapter; which ſeems ridiculous But the occaſion of this ſeems to have been, that the verſe or paſſage wherein ſuch word occurs, was, in point of time, revealed and committed to writing before the other verſes of the ſame chapter which precede it in order; and the title being given to the chapter before it was completed, or the paſſages reduced to their preſent order, the verſe from whence ſuch title was taken did not always happen to begin the chapter. Some chapters have two or more titles, occaſioned by the difference of the copies.

Some of the chapters having been revealed at Mecca, and others at Medina, the noting this difference makes a part of the title: but the reader will obſerve that ſeveral of the chapters are ſaid to have been revealed partly at Mecca, and partly at Medina; and, as to others, it is yet a diſpute among the commentators to which place of the two they belong.

Every chapter is ſubdivided into ſmaller portions, of very unequal length alſo, which we cuſtomarily call *verſes:* but the Arabic word is *Ayat*, the ſame with the Hebrew *Ototh*, and ſignifies *ſigns*, or *wonders;* ſuch as are the ſecrets of God, his attributes, works, judgments, and ordinances, delivered in thoſe verſes; many of which have their particular titles alſo, impoſed in the ſame manner as thoſe of the chapters.

Beſides theſe unequal diviſions of chapter and verſe, the Mohammedans have alſo divided their Koran into ſixty equal portions, which they call Ahzab, in the ſingular Hizb, each ſubdivided into four equal parts; which is alſo an imitation of the Jews, who have an ancient diviſion of their Miſhma into ſixty portions called Maſſictoth: but the Koran is more uſually divided into thirty ſections only, named Ajza, from the ſingular Joz, each of twice the length of the former, and in the like manner ſubdivided into four parts. Theſe diviſions are for the uſe of the readers of the Koran in the royal temples, or in the adjoining chapels where the emperors and great men are interred. There are thirty of theſe readers belonging to every chapel, and each reads his ſection every day, ſo that the whole Koran is read over once a-day.

Next after the title, at the head of every chapter, except only the ninth, is prefixed the following ſolemn form, by the Mohammedans called the Biſmallah, IN THE NAME OF THE MOST MERCIFUL GOD; which form they conſtantly place at the beginning of all their books and writings in general, as a peculiar mark or diſtinguiſhing characteriſtic of their religion, it being counted a ſort of impiety to omit it. The Jews, for the ſame purpoſe, make uſe of the form, *In the name of the* LORD, or, *In the name of the great* GOD: and the eaſtern *Chriſtians* that of, *In the name of the Father, and of the Son, and of the Holy Ghoſt.* But Mohammed probably took this form, as he did many other things, from the Perſian Magi, who uſed to begin their books in theſe words, *Benam Yezdan bakhſhaiſhgher dadar*; that is, *In the name of the moſt merciful juſt* GOD.

There are twenty-nine chapters of the Koran, which have this peculiarity, that they begin with certain letters of the alphabet, ſome with a ſingle one, others with more. Theſe letters the Mohammedans believe to be the peculiar marks of the Koran, and to conceal ſeveral profound myſteries, the certain underſtanding of which, the more intelligent confeſs, has not been communicated to any mortal, their prophet only excepted. Notwithſtanding which, ſome will take the liberty of gueſſing at their meaning by that ſpecies of Cabala called by the Jews Notarikon, and ſuppoſe the letters to ſtand for as many words, expreſſing

expressing the names and attributes of God, his works, ordinances, and decrees; and therefore these mysterious letters, as well as the verses themselves, seem in the Koran to be called signs. Others explain the intent of these letters from their nature or organ, or else from their value in numbers, according to another species of the Jewish Cabala called Gematria; the uncertainty of which conjectures sufficiently appears from their disagreement. Thus, for example, five chapters, one of which is the second, begin with these letters, A. L. M. which some imagine to stand for, *Allah latif magid;* GOD *is gracious and to be glorified*; or, *Ana li minni, to me and from me,* viz. belongs all perfection, and proceeds all good; or else for *Ana Allah alam, I am the most wise* GOD, taking the first letter to mark the beginning of the first word, the second the middle of the second word, and the third the last of the third word; or for *Allah, Gabriel, Mohammed*, the author, revealer, and preacher of the Koran. Others say, that as the letter A belongs to the lower part of the throat, the first of the organs of speech; L to the palate, the middle organ; and M to the lips, which are the last organ; so these letters signify that God is the beginning, middle, and end, or ought to be praised in the beginning, middle, and end, of all our words and actions: or, as the total value of those three letters, in numbers, is seventy-one, they signify, that, in the space of so many years, the religion preached in the Koran should be fully established. The conjecture of a learned Christian is at least as certain as any of the former, who supposes those letters were set there by the *amanuensis*, for *Amar li Mohammed*, i. e. *At the command of Mohammed*, as the five letters prefixed to the nineteenth chapter seem to be there written by a Jewish scribe, for *Coh yaas*, i. e. *Thus he commanded.*

The Koran is universally allowed to be written with the utmost elegance and purity of language, in the dialect of the tribe of Koreish, the most noble and polite of all the Arabians, but with some mixture, though very rarely, of other dialects. It is confessedly the standard of the Arabic tongue, and, as the more orthodox believe, and are taught by the book itself, inimitable by any human pen, (though some sectaries have been of another opinion) and therefore insisted on as a permanent miracle, greater than that of raising the dead, and alone sufficient to convince the world of its divine original.

And to this miracle did Mohammed himself chiefly appeal for the confirmation of his mission, publicly challenging the most eloquent men in Arabia, which was at that time stocked with thousands, whose sole study and ambition it was to excel in elegance of style and composition, to produce even a single chapter that might be compared with it.

The general design of the Koran seems to be this: to unite the professors of the three different religions then followed in the populous country of Arabia, who, for the most part, lived promiscuously, and wandered without guides, the far greater number being idolaters, and the rest Jews and Christians mostly of erroneous and heterodox belief, in the knowledge and worship of one eternal, invisible God, by whose power all things were made, and those which are not may be; the supreme Governor, Judge, and absolute Lord of the creation; established under the sanction of certain laws, and the outward signs of certain ceremonies, partly of ancient, and partly of novel institution, and inforced by setting before them rewards and punishments, both temporal and eternal: and to bring them all to the obedience of Mohammed, as the prophet and ambassador of God, who, after the repeated admonitions, promises and threats of former ages, was at last to establish and propagate God's religion on earth by force of arms, and to be acknowledged chief pontiff in spiritual matters, as well as supreme prince in temporal.

The great doctrine then of the Koran is the unity of God; to restore which point Mohammed pretended was the chief end of his mission; it being laid down by him, as a fundamental truth, that there never was, nor ever can be, more than one true orthodox religion. For, though the particular laws or ceremonies are only temporary, and subject to alteration, according to the divine direction; yet, the substance of it, being eternal truth, is not liable to change, but continues immutably the same. And he taught, that, whenever this religion became neglected, or corrupted in essentials, God had the goodness to re-inform and re-admonish mankind thereof, by several prophets, of whom Moses and Jesus were the most distinguished, till the appearance of Mohammed, who is their seal, no other being to be expected after him. And the more effectually to engage people to hearken to him, great part of the Koran is employed in relating examples of dreadful punishments formerly inflicted by God on those who rejected and abused his messengers; several of which stories, or some circumstances of them, are taken from the Old and New Testament, but many more from the apocryphal books and traditions of the Jews and Christians of those ages, set up in the Koran as truths in opposition to the scriptures, which the Jews and Christians are charged with having altered; and indeed few or none of the relations or circumstances in the Koran were invented by Mohammed, as is generally supposed, it being easy to trace the greatest part of them much higher, as the rest might be, were more of those books extant, and it was worth while to make the inquiry.

The other part of the Koran is taken up in giving necessary laws and directions, in frequent admonitions to moral and divine virtues, and, above all, to the worshipping and reverencing of the only true God, and resignation to his will; among which are many excellent things intermixed, not unworthy even a Christian's perusal.

But besides these, there are a great number of passages which are occasional, and relate to particular emergencies. For whenever any thing happened which perplexed and gravelled Mohammed, and which he could not otherwise get over, he had constant recourse to a new revelation, as an infallible expedient in all nice cases; and he found the success of this method answer his expectation. It was certainly an admirable and politic contrivance of his to bring down the whole Koran at once to the lowest heaven only, and not to the earth as a bungling prophet would probably have done; for if the whole had been published at once, innumerable objections might have been made, which it would have been very hard, if not impossible,

impoſſible, for him to ſolve: but as he pretended to have received it by parcels, as God ſaw proper that they ſhould be publiſhed for the converſion and inſtruction of the people, he had a ſure way to anſwer all emergencies, and to extricate himſelf with honour from any difficulty which might occur.

That Mohammed was really the author and chief contriver of the Koran, is beyond diſpute; though it be highly probable that he had no ſmall aſſiſtance in his deſign from others, as his countrymen failed not to object to him; however, they differed ſo much in their conjectures as to the particular perſons who gave him ſuch aſſiſtance, that they were not able, it ſeems, to prove the charge; Mohammed, it is to be preſumed, having taken his meaſures too well to be diſcovered. Dr. Prideaux has given the moſt probable account of this matter, though chiefly from Chriſtian writers, who generally mix ſuch ridiculous fables with what they deliver, that they deſerve not much credit.

However it be, the Mohammedans abſolutely deny the Koran was compoſed by their prophet himſelf, or any other for him; it being their general and orthodox belief that it is of divine original, nay, that it is eternal and uncreated, remaining, as ſome expreſs it, in the very eſſence of God: that the firſt tranſcript has been from everlaſting by God's throne, written on a table of vaſt bigneſs, called the *preſerved table*, in which are alſo recorded the divine decrees paſt and future: that a copy from this table, in one volume on paper, was by the miniſtry of the angel Gabriel ſent down to the loweſt heaven, in the month of Ramadan, on the night of *power*: from whence Gabriel revealed it to Mohammed by parcels, ſome at Mecca, and ſome at Medina, at different times, during the ſpace of twenty-three years, as the exigency of affairs required; giving him, however, the conſolation to ſhew him the whole (which they tell us was bound in ſilk, and adorned with gold and precious ſtones of paradiſe) once a year; but in the laſt year of his life he had the favour to ſee it twice. They ſay that few chapters were delivered entire, the moſt part being revealed piece-meal, and written down from time to time by the prophet's amanuenſes in ſuch or ſuch a part of ſuch or ſuch a chapter, till they were compleated, according to the directions of the angel. The firſt parcel that was revealed is generally agreed to have been the firſt five verſes of the ninety-ſixth chapter.

After the new revealed paſſages had been from the prophet's mouth taken down in writing by his ſcribe, they were publiſhed to his followers, ſeveral of whom took copies for their private uſe, but the far greater number got them by heart. The originals, when returned, were put promiſcuouſly into a cheſt, obſerving no order of time, for which reaſon it is uncertain when many paſſages were revealed.

When Mohammed died, he left his revelations in the ſame diſorder, and not digeſted into the method, ſuch as it is, which we now find them in. This was the work of his ſucceſſor Abu Becr, who, conſidering that a great number of paſſages were committed to the memory of Mohammed's followers, many of whom were ſlain in their wars, ordered the whole to be collected, not only from the palm-leaves and ſkins on which they had been written, and which were kept between two boards or covers, but alſo from the mouths of ſuch as had gotten them by heart. And this tranſcript, when completed, he committed to the cuſtody of Hafsa the daughter of Omar, one of the prophet's widows.

From this relation it is generally imagined that Abu Becr was really the compiler of the Koran; though, for aught appears to the contrary, Mohammed left the chapters complete as we now have them, excepting ſuch paſſages as his ſucceſſor might add or correct from thoſe who had gotten them by heart; what Abu Becr did elſe being, perhaps, no more than to range the chapters in their preſent order, which he ſeems to have done without any regard to time, having generally placed the longeſt firſt.

However, in the thirtieth year of the Hejra, Othman being then Khalif, and obſerving the great diſagreement in the copies of the Khoran in the ſeveral provinces of the empire, thoſe of Irak, for example, following the reading of Abu Muſa al Aſhari, and the Syrians that of Macdad Ebn Aſwad, he, by advice of the *companions*, ordered a great number of copies to be tranſcribed from that of Abu Becr, in Hafsa's care, under the inſpection of Zeid Ebn Thabet, Abd'allah Ebn Zobair, Said Ebn al As, and Ad'alrahman Ebn al Hareth the Makhzumite; whom he directed, that, where-ever they diſagreed about any word, they ſhould write it in the dialect of the Koreiſh, in which it was at firſt delivered. Theſe copies, when made, were diſperſed in the ſeveral provinces of the empire, and the old ones burnt and ſuppreſſed. Though many things in Hafsa's copy were corrected by the abovementioned ſupervifors, yet ſome few various readings ſtill occur.

The fundamental poſition, on which Mohammed erected the ſuperſtructure of his religion, was, That, from the beginning to the end of the world, there has been, and for ever will be, but one true orthodox belief; conſiſting, as to matter of faith, in the acknowledging of the only true God, and the believing in and obeying ſuch meſſengers or prophets as he ſhould from time to time ſend, with proper credentials, to reveal his will to mankind; and, as to matter of practice, in the obſervance of the immutable and eternal laws of right and wrong, together with ſuch other precepts and ceremonies as God ſhould think fit to order for the time being, according to the different diſpenſations in different ages of the world: for theſe laſt, he allowed, were things indifferent in their own nature, and became obligatory by God's poſitive precept only; and were therefore temporary, and ſubject to alteration, according to his will and pleaſure. And to this religion he gives the name of Iſlam, which word ſignifies *reſignation*, or *ſubmiſſion* to the ſervice and commands of God; and is uſed as the proper name of the Mohammedan religion, which they will alſo have to be the ſame at bottom with that of all the prophets from Adam.

Under pretext that this eternal religion was in his time corrupted, and profeſſed in its purity by no one ſect of men, Mohammed pretended to be a prophet ſent by God, to reform thoſe abuſes which had crept into it, and to reduce it to its primitive ſimplicity; with the addition

however

however of peculiar laws and ceremonies, ſome of which had been uſed in former times, and others were now firſt inſtituted. And he comprehended the whole ſubſtance of his doctrine under theſe two propoſitions, or articles of faith, *viz.* that there is but one God, and that himſelf was the apoſtle of God; in conſequence of which latter article, all ſuch ordinances and inſtitutions as he thought fit to eſtabliſh muſt be received as obligatory and of divine authority.

The Mohammedans divide their religion, which they call Iſlam, into two diſtinct parts; Iman, i. e. *faith*, or theory; and Din, i. e. *religion*, or practice; and teach that it is built on five fundamental points, one belonging to faith, and the other four to practice.

The firſt is, that *there is no god but the true* God; and *that* Mohammed *is his apoſtle*. Under which they comprehend ſix diſtinct branches, *viz.* 1. *Belief in* God; 2. *In his angels*; 3. *In his ſcriptures*; 4. *In his prophets*; 5. *In the reſurrection and day of judgment*; and, 6. *In* God'*s abſolute decree and predetermination both of good and evil.*

The four points relating to practice are, 1. Prayer, under which are comprehended thoſe waſhings or purifications which are neceſſary preparations required before prayer; 2. Alms; 3. Faſting; and, 4. The pilgrimage to Mecca.

That both Mohammed, and thoſe among his followers who are reckoned orthodox, had and continue to have juſt and true notions of God and his attributes, appears ſo plain from the Koran itſelf, and all the Mohammedan divines, that it would be loſs of time to refute thoſe who ſuppoſe the God of Mohammed to be different from the true God, and only a fictitious deity, or idol of his own creation.

The exiſtence of angels, and their purity, are abſolutely required to be believed in the Koran; and he is reckonan infidel who denies there are ſuch beings, or hates any of them, or aſſerts any diſtinction of ſexes among them. They believe them to have pure and ſubtile bodies, created of fire; that they neither eat nor drink, nor propagate their ſpecies; that they have various forms and offices; ſome adoring God in different poſtures, others ſinging praiſes to him, or interceding for mankind. They hold, that ſome of them are employed in writing down the actions of men, others in carrying the throne of God and other ſervices.

The four angels, whom they look on as more eminently in God's favour, and often mention on account of the offices aſſigned them, are Gabriel, to whom they give ſeveral titles, particularly thoſe of the *holy ſpirit*, and the *angel of revelations*, ſuppoſing him to be honoured by God with a greater confidence than any other, and to be employed in writing down the divine decrees; Michael, the friend and protector of the Jews; Azrael, the *angel of death*, who ſeparates mens ſouls from their bodies; and Iſrafil, whoſe office it will be to ſound the trumpet at the reſurrection. The Mohammedans alſo believe, that two guardian angels attend on every man, to obſerve and write down his actions, being changed every day, and therefore called al Moakkibat, or the angels who continually ſucceed one another.

The devil, whom Mohammed names Eblis, from his *deſpair*, was once one of thoſe angels who are neareſt to God's preſence, called Azazil; and fell, according to the doctrine of the Koran, for refuſing to pay homage to Adam at the command of God.

Beſides angels and devils, the Mohammedans are taught by the Koran to believe an intermediate order of creatures, which they call Jin or Genii, created alſo of fire, but of a groſſer fabric than angels; ſince they eat and drink, and propagate their ſpecies, and are ſubject to death. Some of theſe are ſuppoſed to be good, and others bad, and capable of future ſalvation or damnation, as men are; whence Mohammed pretended to be ſent for the converſion of genii as well as men.

As to the ſcriptures, the Mohammedans are taught by the Koran, that God, in divers ages of the world, gave revelations of his will in writing to ſeveral prophets, the whole and every word of which it is abſolutely neceſſary for a good Moſlem to believe. The number of theſe ſacred books were, according to them, 104. Of which ten were given to Adam, fifty to Seth, thirty to Edris or Enoch, ten to Abraham; and the other four, being the Pentateuch, the Pſalms, the Goſpel, and the Koran, were ſucceſſively delivered to Moſes, David, Jeſus, and Mohammed; which laſt being the ſeal of the prophets, thoſe revelations are now cloſed, and no more are to be expected. All theſe divine books, except the four laſt, they agree to be now entirely loſt, and their contents unknown; though the Sabians have ſeveral books which they attribute to ſome of the antediluvian prophets. And of thoſe four, the Pentateuch, Pſalms, and Goſpel, they ſay, have undergone ſo many alterations and corruptions, that, though there may poſſibly be ſome part of the true word of God therein, yet no credit is to be given to the preſent copies in the hands of the Jews and Chriſtians. The Mohammedans have alſo a goſpel in Arabic, attributed to St Barnabas, wherein the hiſtory of Jeſus Chriſt is related in a manner very different from what we find in the true Goſpels, and correſpondent to thoſe traditions which Mohammed has followed in his Koran. Of this Goſpel the Moriſcoes in Africa have a tranſlation in Spaniſh; and there is, in the library of prince Eugene of Savoy, a manuſcript of ſome antiquity, containing an Italian tranſlation of the ſame Goſpel, made, it is to be ſuppoſed, for the uſe of renegades. This book apppears to be no original forgery of the Mohammedans, though they have no doubt interpolated and altered it ſince, the better to ſerve their purpoſe; and in particular, inſtead of the Paraclete or Comforter, they have in this apocryphal goſpel inſerted the word Periclyte, that is, the *famous* or *illuſtrious*, by which they pretend their prophet was foretold by name, that being the ſignification of Mohammed in Arabic: and this they ſay to juſtify that paſſage of the Koran, where Jeſus Chriſt is formally aſſerted to have foretold his coming, under his other name of Ahmed, which is derived from the ſame root as Mohammed, and of the ſame import. From theſe or ſome other forgeries of the ſame ſtamp, it is that the Mohammedans quote ſeveral paſſages, of which there are not the leaſt footſteps in the *New Teſtament*.

The number of the prophets, which have been from time

time to time ſent by God into the world, amounts to no leſs than 224,000, according to one Mohammedan tradition, or to 124,000, according to another; among whom 313 were apoſtles, ſent with ſpecial commiſſions to reclaim mankind from infidelity and ſuperſtition; and ſix of them brought new laws or diſpenſations, which ſucceſſively abrogated the preceding: theſe were Adam, Noah, Abraham, Moſes, Jeſus, and Mohammed. All the prophets in general, the Mohammedans believe to have been free from great ſins and errors of conſequence, and profeſſors of one and the ſame religion, that is, Iſlam, notwithſtanding the different laws and inſtitutions which they obſerved. They allow of degrees among them, and hold ſome of them to be more excellent and honourable than others. The firſt place they give to the revealers and eſtabliſhers of new diſpenſations, and the next to the apoſtles.

In this great number of prophets, they not only reckon divers patriarchs and perſons named in ſcripture, but not recorded to have been prophets, (wherein the Jewiſh and Chriſtian writers have ſometimes led the way,) as Adam, Seth, Lot, Iſmael, Nun, Joſhua, *&c.* and introduce ſome of them under different names, as Enoch, Heber, and Jethro, who are called, in the Koran, Edris, Hud, and Shoaib; but ſeveral others whoſe very names do not appear in ſcripture (though they endeavour to find ſome perſons there to fix them on) as, Saleh, Khedr, Dhu'lkefl, *&c.*

The next article of faith required by the Koran is the belief of a general reſurrection and a future judgment.

When a corpſe is laid in the grave, they ſay he is received by an angel, who gives him notice of the coming of the two Examiners; which are two black livid angels, of a terrible appearance, named Monker and Nakir. Theſe order the dead perſon to ſit upright, and examine him concerning his faith, as to the unity of God, and the miſſion of Mohammed: if he anſwer rightly, they ſuffer the body to reſt in peace, and it is refreſhed by the air of paradiſe; but, if not, they beat him on the temples with iron maces, till he roars out for anguiſh ſo loud that he is heard by all from eaſt to weſt, except men and genii. Then they preſs the earth on the corpſe, which is gnawed and ſtung till the reſurrection by ninety-nine dragons, with ſeven heads each; or, as others ſay, their ſins will become venomous beaſts, the grievous ones ſtinging like dragons, the ſmaller like ſcorpions, and the others like ſerpents: circumſtances which ſome underſtand in a figurative ſenſe.

As to the ſoul, they hold, that, when it is ſeparated from the body by the angel of death, who performs his office with eaſe and gentleneſs towards the good, and with violence towards the wicked, it enters into that ſtate which they call al Berzakh, or *the interval* between death and the reſurrection. If the departed perſon was a believer, they ſay two angels meet it, who convey it to heaven, that its place there may be aſſigned, according to its merit and degree. For they diſtinguiſh the ſouls of the faithful into three claſſes; the firſt of prophets, whoſe ſouls are admitted into paradiſe immediately; the ſecond of martyrs, whoſe ſpirits, according to a tradition of Mohammed, reſt in the crops of green birds, which eat of the fruits and drink of the rivers of paradiſe; and the third of other believers, concerning the ſtate of whoſe ſouls before the reſurrection there are various opinions.

Though ſome among the Mohammedans have thought that the reſurrection will be merely ſpiritual, and no more than the returning of the ſoul to the place whence it firſt came (an opinion defended by Ebn Sina, and called by ſome the *opinion of the philoſophers*;) and others, who allow man to conſiſt of body only, that it will be merely corporeal; the received opinion is, that both body and ſoul will be raiſed; and their doctors argue ſtrenuouſly for the poſſibility of the reſurrection of the body, and diſpute with great ſubtilty concerning the manner of it. But Mohammed has taken care to preſerve one part of the body, whatever becomes of the reſt, to ſerve for a baſis of the future edifice, or rather a leaven for the maſs which is to be joined to it. For he taught, that a man's body was entirely conſumed by the earth, except only the bone called al Ajb, which we name the *os coccygis*, or rump bone; and that, as it was the firſt formed in the human body, it will alſo remain uncorrupted till the laſt day, as a ſeed from whence the whole is to be renewed: and this, he ſaid, would be effected by a forty days rain, which God ſhould ſend, and which would cover the earth to the height of twelve cubits, and cauſe the bodies to ſprout forth like plants. Herein, alſo, is Mohammed beholden to the Jews; who ſay the ſame things of the bone Luz, excepting that what he attributes to a great rain, will be effected, according to them, by a dew, impregnating the duſt of the earth.

The time of the reſurrection the Mohammedans allow to be a perfect ſecret to all but God alone; the angel Gabriel himſelf acknowledging his ignorance in this point, when Mohammed aſked him about it. However, they ſay, the approach of that day may be known from certain ſigns which are to precede it. Theſe ſigns they diſtinguiſh into two ſorts, the leſſer, and the greater.

The leſſer ſigns are, 1. The decay of faith among men. 2. The advancing of the meaneſt perſons to eminent dignity. 3. That a maid-ſervant ſhall become the mother of her miſtreſs (or maſter;) by which is meant, either that towards the end of the world men ſhall be much given to ſenſuality, or that the Mohammedans ſhall then take many captives. 4. Tumults and ſeditions. 5. A war with the Turks. 6. Great diſtreſs in the world, ſo that a man when he paſſes by another's grave, ſhall ſay, Would to God I were in his place. 7. That the provinces of Irak and Syria ſhall refuſe to pay their tribute. And, 8. That the buildings of Medina ſhall reach to Ahab, or Yahab.

The greater ſigns are,

1. The ſun's riſing in the weſt; which ſome have imagined it originally did.

2. The appearance of the beaſt, which ſhall riſe out of the earth, in the temple of Mecca, or on mount Safa, or in the territory of Tayef, or ſome other place. This beaſt, they ſay, is to be ſixty cubits high; though others, not ſatiſfied with ſo ſmall a ſize, will have her reach to the clouds and to heaven, when her head only is out; and that ſhe will appear for three days, but ſhew only a third part of her body. They deſcribe this monſter, as to

to her form, to be a compound of various ſpecies; having the head of a bull, the eyes of a hog, the ears of an elephant, the horns of a ſtag, the neck of an oſtrich, the breaſt of a lion, the colour of a tiger, the back of a cat, the tail of a ram, the legs of a camel, and the voice of an aſs. Some ſay this beaſt is to appear three times in ſeveral places, and that ſhe will bring with her the rod of Moſes and the ſeal of Solomon; and, being ſo ſwift that none can overtake or eſcape her, will with the firſt ſtrike all the believers on the face, and mark them with the word mumen *i. e.* believer; and with the latter will mark the unbelievers on the face likewiſe, with the word Cafer, *i. e. infidel*, that every perſon may be known for what he really is. They add that the ſame beaſt is to demonſtrate the vanity of all religions except Iſlam, and to ſpeak Arabic. All this ſtuff ſeems to be the reſult of a confuſed idea of the beaſt in the Revelations.

3. War with the Greeks, and the taking Conſtantinople by 70,000 of the poſterity of Iſaac, who ſhall not win that city by force of arms, but the walls ſhall fall down while they cry out, *There is no God but* God: God *is moſt great!* As they are dividing the ſpoil, news will come to them of the appearance of Antichriſt; whereupon they ſhall leave all, and return back.

4. The coming of Antichriſt, whom the Mohammedans call Maſib al Dajjal, *i. e.* the falſe or lying Chriſt, and ſimply al Dajjal. He is to be one eyed, and marked on the forehead with the letters C. F. R. ſignifying Cafer, or infidel. They ſay that the Jews give him the name of Meſſiah Ben David, and pretend he is to come in the laſt days, and to be lord both of land and ſea, and that he will reſtore the kingdom to them.

5. The deſcent of Jeſus on earth. They pretend that he is to deſcend near the white tower to the eaſt of Damaſcus, when the people are returned from the taking of Conſtantinople; that he is to embrace the Mohammedan religion, marry a wife, get children, kill Antichriſt, and at length die after forty years, or, according to others, twenty four years continuance on earth. Under him, they ſay, there will be great ſecurity, and plenty in the world, all hatred and malice being laid aſide; when lions and camels, bears and ſheep, ſhall live in peace, and a child ſhall play with ſerpents unhurt.

6. War with the Jews; of whom the Mohammedans are to make a prodigious ſlaughter, the very trees and ſtones diſcovering ſuch of them as hide themſelves, except only the tree called Gharkad, which is the tree of the Jews.

7. The eruption of Gog and Magog, or, as they are called in the eaſt, Yajuj and Majuj; of whom many things are related in the Koran and the traditions of Mohammed. Theſe barbarians, they tell us, having paſſed the lake of Tiberias, which the vanguard of their vaſt army will drink dry, will come to Jeruſalem, and there greatly diſtreſs Jeſus and his companions; till, at his requeſt, God will deſtroy them, and fill the earth with their carcaſes, which, after ſome time, God will ſend birds to carry away, at the prayers of Jeſus and his followers. Their bows, arrows, and quivers, the Moſlems will burn for ſeven years together; and, at laſt, God will ſend a rain to cleanſe the earth, and to make it fertile.

8. A ſmoke, which ſhall fill the whole earth.

9. An eclipſe of the moon. Mohammed is reported to have ſaid, that there would be three eclipſes before the laſt hour; one to be ſeen in the eaſt, another in the weſt, and the third in Arabia.

10. The returning of the Arabs to the worſhip of Allat and al Uzza, and the reſt of their ancient idols, after the deceaſe of every one in whoſe heart there was faith equal to a grain of muſtard-ſeed, none but the very worſt of men being left alive. For God, they ſay, will ſend a cold odoriferous wind, blowing from Syria Damaſcena, which ſhall ſweep away the ſouls of all the faithful, and the Koran itſelf, ſo that men will remain in the groſſeſt ignorance for an hundred years.

11. The diſcovery of a vaſt heap of gold and ſilver by the retreating of the Euphrates, which will be the deſtruction of many.

12. The demolition of the Caaba, or temple of Mecca, by the Ethiopians.

13. The ſpeaking of beaſts and inanimate things.

14. The breaking out of fire in the province of Hejaz; or, according to others, in Yaman.

15. The appearance of a man of the decendants of Kahtan, who ſhall drive men before him with his ſtaff.

16. The coming of the Mohdi, or director; concerning whom Mohammed propheſied, that the world ſhould not have an end till one of his own family ſhould govern the Arabians, whoſe name ſhould be the ſame with his own name, and whoſe father's name ſhould alſo be the ſame with his father's name; and who ſhould fill the earth with righteouſneſs. This perſon the Shiites believe to be now alive, and concealed in ſome ſecret place, till the time of his manifeſtation; for they ſuppoſe him no other than the laſt of the twelve Imams, named Mohammed Abu'lkaſem, as their prophet was: and the ſon of Haſſan al Aſkeri, the eleventh of that ſucceſſion. He was born at Sermanrai in the 255th year of the Hejra. From this tradition, it is to be preſumed, an opinion pretty current among the Chriſtians took its riſe, that the Mohammedans are in expectation of their prophet's return.

17. A wind which ſhall ſweep away the ſouls of all who have but a grain of faith in their hearts, as has been mentioned under the tenth ſign.

Theſe are the greater ſigns, which, according to their doctrine, are to precede the reſurrection, but ſtill leave the hour of it uncertain; for the immediate ſign of its being come will be the firſt blaſt of the trumpet; which they believe will be ſounded three times. The firſt they call the *blaſt of conſternation;* at the hearing of which all creatures in heaven and earth ſhall be ſtruck with terror, except thoſe whom God ſhall pleaſe to exempt from it. The effects attributed to this firſt ſound of the trumpet are very wonderful; for they ſay, the earth will be ſhaken, and not only all buildings, but the very mountains levelled; that the heavens ſhall melt, the ſun be darkened, the ſtars fall, on the death of the angels, who, as ſome imagine, hold them ſuſpended between heaven and earth; and the ſea ſhall be troubled and dried up, or, according to others, turned into flames, the ſun, moon, and ſtars being thrown into it: the Koran, to expreſs the greatneſs of the terror of that day, adds, that women who

give

give fuck fhall abandon the care of their infants, and even the fhe camels which have gone ten months with young (a moft valuable part of the fubftance of that nation) fhall be utterly neglected. A farther effect of this blaft will be that concourfe of beafts mentioned in the Koran, though fome doubt whether it be to precede the refurrection or not. They who fuppofe it will precede, think that all kinds of animals, forgetting their refpective natural fiercenefs and timidity, will run together into one place, being terrified by the found of the trumpet and the fudden fhock of nature.

The Mohammedans believe that this firft blaft will be followed by a fecond, which they call the *blaft of exanimation;* when all creatures both in heaven and earth fhall die or be annihilated, except thofe which God fhall pleafe to exempt from the common fate; and this, they fay, fhall happen in the twinkling of an eye, nay in an inftant; nothing furviving except God alone, with paradife and hell, and the inhabitants of thofe two places, and the throne of glory. The laft who fhall die will be the angel of death.

Forty years after this will be heard the *blaft of refurrection*, when the trumpet fhall be founded the third time by Ifrafil, who, together with Grabriel and Michael, will be previoufly reftored to life, and, ftanding on the rock of the temple of Jerufalem, fhall, at God's command, call together all the dry and rotten bones, and other difperfed parts of the bodies, and the very hairs, to judgment. This angel, having, by the divine order, fet the trumpet to his mouth, and called together all the fouls from all parts, will throw them into his trumpet, from whence, on his giving the laft found, at the command of God, they will fly forth like bees, and fill the whole fpace between heaven and earth, and then repair to their refpective bodies, which the opening earth will fuffer to arife; and the firft who fhall fo arife, according to a tradition of Mohammed, will be himfelf. For this birth the earth will be prepared by the rain above mentioned, which is to fall continually for forty years, and will refemble the feed of a man, and be fupplied from the water under the throne of God, which is called *living water;* by the efficacy and virtue of which the dead bodies fhall fpring forth from their graves, as they did in their mother's womb, or as corn fprouts forth by common rain, till they become perfect; after which breath will be breathed into them, and they will fleep in their fepulchres till they are raifed to life at the laft trump.

When thofe who have rifen fhall have waited the limited time, the Mohammedans believe God will at length appear to judge them; Mohammed undertaking the office of interceffor, after it fhall have been declined by *Adam*, *Noah*, *Abraham*, and *Jefus*, who fhall beg deliverance only for their own fouls. They fay, that on this folemn occafion God will come in the clouds furrounded by angels, and will produce the books wherein the actions of every perfon are recorded by their guardian angels, and will command the prophets to bear witnefs againft thofe to whom they have been refpectively fent. Then every one will be examined concerning all his words and actions, uttered and done by him in this life; not as if God needed any information in thefe refpects, but to oblige the perfon to make public confeffion and acknowledgment of God's juftice. The particulars of which they fhall give an account, as Mohammed himfelf enumerated them, are, of their time, how they fpent it; of their wealth, by what means they acquired it, and how they employed it; of their bodies, wherein they exercifed them; of their knowledge and learning, what ufe they made of them. To the queftions we have mentioned each perfon fhall anfwer, and make his defence in the beft manner he can, endeavouring to excufe himfelf by cafting the blame of his evil deeds on others; fo that a difpute fhall arife even between the foul and the body, to which of them their guilt ought to be imputed: the foul faying, *O Lord, my body I received from thee; for thou createdft me without a hand to lay hold with, a foot to walk with, an eye to fee with, or an underftanding to apprehend with, till I came and entered into this body; therefore punifh it eternally, but deliver me.* The body, on the other fide, will make this apology: *O Lord, thou createdft me like a ftock of wood, having neither hand that I could lay hold with, nor foot that I could walk with, till this foul, like a ray of light, entered into me, and my tongue began to fpeak, my eye to fee, and my foot to walk; therefore punifh it eternally, but deliver me.* But God will propound to them the following parable of the blind man and the lame man, which, as well as the preceding difpute, was borrowed by the Mohammedans from the Jews. A certain king, having a pleafant garden, in which were ripe fruits, fet two perfons to keep it, one of whom was blind, and the other lame; the former not being able to fee the fruit, nor the lattter to gather it: the lame man, however, feeing the fruit, perfuaded the blind man to take him upon his fhoulders and by that means he eafily gathered the fruit; which they divided between them. The lord of the garden coming fome time after, and inquiring after his fruit, each began to excufe himfelf; the blind man faid he had no eyes to fee with, and the lame man that he had no feet to approach the trees. But the king, ordering the lame man to be fet on the blind, paffed fentence on and punifhed them both. And in the fame manner will God deal with the body and the foul. As thefe apologies will not avail on that day, fo will it alfo be in vain for any one to deny his evil actions, fince men and angels, and his own members, nay, the very earth itfelf, will be ready to bear witnefs againft him.

At this examination they alfo believe, that each perfon will have the book wherein all the actions of his life are written delivered to him; which books the righteous will receive in their right hand, and read with great pleafure and fatisfaction; but the ungodly will be obliged to take them, againft their wills, in their left, which will be bound behind their backs, their right hand being tied up to their necks,

To fhew the exact juftice which will be obferved on this great day of trial, the next thing they defcribe is the *balance*, wherein all things fhall be weighed. They fay it will be held by Gabriel; and that it is of fo vaft a fize, that its two fcales, one of which hangs over paradife, and the other over hell, are capacious enough to contain both heaven and earth. Though fome are willing to underftand what is faid in the Koran concerning this

this balance allegorically, and only as a figurative representation of God's equity; yet the more ancient and orthodox opinion is, that they are to be taken literally; and since words and actions, being mere accidents, are not capable of being themselves weighed, they say that the books wherein they are written will be thrown into the scales, and according as those wherein the good or evil actions are recorded shall preponderate, sentence will be given: those whose balances laden with good works shall be heavy, will be saved; but those whose balances are light, will be condemned. Nor will any one have cause to complain that God suffers any good action to pass unrewarded, because the wicked for the good they do have their reward in this life, and therefore can expect no favour in the next.

This examination being past, and every one's works weighed in a just balance, that mutual retaliation will follow, according to which every creature will take vengeance one of another, or have satisfaction made them for the injuries which they have suffered. And, since there will then be no other way of returning like for like, the manner of giving this satisfaction will be by taking away a proportional part of the good works of him who offered the injury, and adding it to those of him who suffered it. Which being done, if the angels (by whose ministry this is to be performed) say, *Lord, we have given to every one his due, and there remaineth of this person's good works so much as equalleth the weight of an ant*, God will, of his mercy, cause it to be doubled unto him, that he may be admitted into paradise; but if, on the contrary, his good works be exhausted, and there remain evil works only, and there be any who have not yet received satisfaction from him, God will order that an equal weight of their sins be added unto his, that he may be punished for them in their stead, and he will be sent to hell laden with both. This will be the method of God's dealing with mankind. As to brutes, after they shall have likewise taken vengeance of one another, he will command them to be changed into dust; wicked men being reserved to more grievous punishment, so that they shall cry out, on hearing this sentence passed on the brutes, *Would to* GOD *that we were dust also*. As to the genii, many Mohammedans are of opinion, that such of them as are true believers, will undergo the same fate as the irrational animals, and have no other reward than the favour of being converted into dust; and for this they quote the authority of their prophet.

The trials being over, and the assembly dissolved, the Mohammedans hold, that those who are to be admitted into paradise will take the right hand way, and those who are destined to hell-fire will take the left; but both of them must first pass the bridge called in Arabic *al Sirat*, which they say is laid over the midst of hell, and describe to be finer than a hair and sharper than the edge of a sword; so that it seems very difficult to conceive how any one shall be able to stand upon it: for which reason, most of the sect of the Motazalites reject it as a fable; though the orthodox think it a sufficient proof of the truth of this article, that it was seriously affirmed by him who never asserted a falsehood, meaning their prophet; who, to add to the difficulty of the passage, has likewise declared, that this bridge is beset on each side with briars and hooked thorns; which will however be no impediment to the good, for they shall pass with wonderful ease and swiftness, like lightning, or the wind, Mohammed and his Moslems leading the way; whereas the wicked, what with the slipperiness and extreme narrowness of the path, the intangling of the thorns, and the extinction of the light which directed the former to paradise, will soon miss their footing, and fall down headlong into hell, which is gaping beneath them.

As to the punishment of the wicked, the Mohammedans are taught, that hell is divided into seven stories or apartments, one below another, designed for the reception of as many distinct classes of the damned. The first, which they call Jehennam, they say, will be the receptacle of those who acknowledged one God, that is, the wicked Mohammedans, who, after having there been punished according to their demerits, will at length be released. The second, named Ladha, they assign to the Jews; the third, named al Hotama, to the Christians; the fourth, named al Sair, to the Sabians; the fifth, named Sakar, to the Magians; the sixth, named al Jahim, to the idolaters; and the seventh, which is the lowest and worst of all, and is called al Hawyat, to the hypocrites, or those who outwardly professed some religion, but in their hearts were of none. Over each of these apartments they believe there will be set a guard of angels, nineteen in number; to whom the damned will confess the just judgment of God, and beg them to intercede with him for some alleviation of their pain, or that they may be delivered by being annihilated.

Mohammed has, in his Koran and traditions, been very exact in describing the various torments of hell, which, according to him, the wicked will suffer both from intense heat and excessive cold. We shall however enter into no detail of them here, but only observe, that the degrees of these pains will also vary in proportion to the crimes of the sufferer, and the apartment he is condemned to; and that he who is punished the most lightly of all will be shod with shoes of fire, the fervor of which will cause his skull to boil like a cauldron. The condition of these unhappy wretches, as the same prophet teaches, cannot be properly called either life or death; and their misery will be greatly increased by their despair of being ever delivered from that place, since, according to that frequent expression in the Koran, *they must remain therein for ever*. It must be remarked, however, that the infidels alone will be liable to eternity of damnation; for the Moslems, or those who have embraced the true religion, and have been guilty of heinous sins, will be delivered thence after they shall have expiated their crimes by their sufferings. The time which these believers shall be detained there, according to a tradition handed down from their prophet, will not be less than 900 years, nor more than 7000. And, as to the manner of their delivery, they say that they shall be distinguished by the marks of prostration on those parts of their bodies with which they used to touch the ground in prayer, and over which the fire will therefore have no power; and that, being known by this characteristic, they will be released by the mercy of God, at the intercession

ceſſion of Mohammed and the bleſſed; whereupon thoſe who ſhall have been dead, will be reſtored to life, as has been ſaid; and thoſe whoſe bodies ſhall have contracted any ſootineſs or filth from the flames and ſmoke of hell, will be immerſed in one of the rivers of paradiſe, called the *river of life*, which will waſh them whiter than pearls.

The righteous, as the Mohammedans are taught to believe, having ſurmounted the difficulties, and paſſed the ſharp bridge above-mentioned, before they enter paradiſe, will be refreſhed by drinking at the *pond* of their prophet, who deſcribes it to be an exact ſquare of a month's journey in compaſs; its water, which is ſupplied by two pipes from al Cawthar, one of the rivers of paradiſe, being whiter than milk or ſilver, and more odoriferous than muſk, with as many cups ſet around it as there are ſtars in the firmament; of which water whoever drinks will thirſt no more for ever. This is the firſt taſte which the bleſſed will have of their future and now near approaching felicity.

Though paradiſe be ſo very frequently mentioned in the Koran, yet it is a diſpute among the Mohammedans whether it be already created, or be to be created hereafter; the Motazalites and ſome other ſectaries aſſerting that there is not at preſent any ſuch place in nature, and that the paradiſe which the righteous will inhabit in the next life will be different from that from which Adam was expelled. However, the orthodox profeſs the contrary, maintaining that it was created even before the world, and deſcribe it, from their prophet's traditions, in the following manner.

They ſay it is ſituate above the ſeven heavens (or in the ſeventh heaven) and next under the throne of God; and, to expreſs the amenity of the place, tell us, that the earth of it is of the fineſt wheat flour, or of the pureſt muſk, or, as others will have it, of ſaffron: that its ſtones are pearls and jacinths, the walls of its buildings enriched with gold and ſilver, and that the trunks of all its trees are of gold; among which the moſt remarkable is the tree called Tuba, or the tree of happineſs. Concerning this tree, they fable, that it ſtands in the palace of Mohammed, though a branch of it will reach to the houſe of every true believer; that it will be laden with pomegranates, grapes, dates, and other fruit, of ſurpriſing bigneſs, and of taſtes unknown to mortals. So that, if a man deſire to eat of any particular kind of fruit, it will immediately be preſented him; or, if he chuſe fleſh, birds ready dreſſed will be ſet before him, according to his wiſh. They add, that the boughs of this tree will ſpontaneouſly bend down to the hand of the perſon who would gather of its fruits, and that it will ſupply the bleſſed not only with food, but alſo with ſilken garments, and beaſts to ride on ready ſaddled and bridled, and adorned with rich trappings, which will burſt forth from its fruits; and that this tree is ſo large, that a perſon, mounted on the fleeteſt horſe, would not be able to gallop from one end of its ſhade to the other in a hundred years.

As plenty of water is one of the greateſt additions to the pleaſantneſs of any place, the Koran often ſpeaks of the rivers of paradiſe as a principal ornament thereof: ſome of theſe rivers, they ſay, flow with water, ſome with milk, ſome with wine, and others with honey; all taking their riſe from the root of the tree Tuba.

But all theſe glories will be eclipſed by the reſplendent and raviſhing girls of paradiſe, called, from their large black eyes, *Hur al oyun*, the enjoyment of whoſe company will be a principal felicity of the faithful. Theſe, they ſay, are created, not of clay, as mortal women are, but of pure muſk; being, as their prophet often affirms in his Koran, free from all natural impurities, defects, and inconveniences incident to the ſex, of the ſtricteſt modeſty, and ſecluded from public view in pavilions of hollow pearls, ſo large, that, as ſome traditions have it, one of them will be no leſs than four paraſangs (or, as others ſay, ſixty miles) long, and as many broad.

The name which the Mohammedans uſually give to this happy manſion, is *al Jannat*, or *the garden*; and ſometimes they call it, with an addition, *Jannat al Ferdaws*, *the garden of paradiſe*; *Jannat Aden*, *the garden of Eden*, (though they generally interpret the word *Eden*, not according to its acceptation in Hebrew, but according to its meaning in their own tongue, wherein it ſignifies a *ſettled* or *perpetual habitation*;) *Jannat alMawa*, *the garden of abode*; *Jannat al Naim*, *the garden of pleaſure*; and the like: by which ſeveral appellations, ſome underſtand ſo many different gardens, or at leaſt places of different degrees of felicity, (for they reckon no leſs than an hundred ſuch in all,) the very meaneſt whereof will afford its inhabitants ſo many pleaſures and delights, that one would conclude they muſt even ſink under them, had not Mohammed declared, that, in order to qualify the bleſſed for a full enjoyment of them, God will give to every one the abilities of an hundred men.

The ſixth great point of faith, which the Mohammedans are taught by the Koran to believe, is God's abſolute decree and predeſtination both of good and evil. For the orthodox doctrine is, that whatever hath or ſhall come to paſs in this world, whether it be good, or whether it be bad, proceedeth entirely from the divine will, and is irrevocably fixed and recorded from all eternity in the preſerved table: God having ſecretly predetermined not only the adverſe and proſperous fortune of every perſon in this world, in the moſt minute particulars, but alſo his faith or infidelity, his obedience or diſobedience, and conſequently his everlaſting happineſs or miſery after death; which fate or predeſtination it is not poſſible, by any foreſight or wiſdom, to avoid.

Of this doctrine Mohammed makes great uſe in his Koran for the advancement of his deſigns; encouraging his followers to fight without fear, and even deſperately, for the propagation of their faith, by repreſenting to them that all their caution could not avert their inevitable deſtiny, or prolong their lives for a moment; and deterring them from diſobeying or rejecting him as an impoſtor, by ſetting before them the danger they might thereby incur of being, by the juſt judgment of God, abandoned to ſeduction, hardneſs of heart, and a reprobate mind, as a puniſhment for their obſtinacy.

Of the four fundamental points of religious practice required by the Koran, the firſt is *prayer*, under which are alſo comprehended thoſe legal waſhings or purifications which are neceſſary preparations thereto.

Of these purifications there are two degrees, one called *Ghosl*, being a total immersion or bathing of the body in water; and the other called *Wodu*, (by the Persians, *Abdest*,) which is the washing of their faces, hands, and feet, after a certain manner. The first is required in some extraordinary cases only, as after having lain with a woman, or been polluted by emission of seed, or by approaching a dead body; women also being obliged to it after their courses or childbirth. The latter is the ordinary ablution in common cases, and before prayer, and must necessarily be used by every person before he can enter upon that duty. It is performed with certain formal ceremonies, which have been described by some writers, but much easier apprehended by seeing them done, than by the best description.

That his followers might be more punctual in this duty, Mohammed is said to have declared, that *the practice of religion is founded on cleanliness*, which is the *one half of the faith*, and *the key of prayer*, without which it will not be heard by God. That these expressions may be the better understood, *al Ghazali* reckons four degrees of purification; of which the first is the cleansing of the body from all pollution, filth, and excrements; the second, the cleansing of the members of the body from all wickedness and unjust actions; the third, the cleansing the heart from all blameable inclinations and odious vices; and the fourth, the purging a man's secret thoughts from all affections which may divert their attendance on God: adding, that the body is but as the outward shell, in respect to the heart, which is as the kernel.

Circumcision, though it be not so much as once mentioned in the Koran, is yet held, by the Mohammedans, to be an ancient divine institution, confirmed by the religion of islam, and, though not so absolutely necessary but that it may be dispensed with in some cases, yet highly proper and expedient. The Arabs used this rite for many ages before Mohammed, having probably learned it from Ishmael, though not only his descendents, but the Hamyarites and other tribes practised the same. The Ishmaelites, we are told, used to circumcise their children, not on the eighth day, as is the custom of the Jews, but when about twelve or thirteen years old, at which age their father underwent that operation; and the Mohammedans imitate them so far as not to circumcise children before they be able at least distinctly to pronounce that profession of their faith, *There is no* God *but* God, Mohammed *is the apostle of* God; but pitch on what age they please for the purpose, between six or sixteen, or thereabouts

Prayer was, by Mohammed, thought so necessary a duty, that he used to call it *the pillar of religion*, and *the key of paradise*; and when the Thakifites, who dwelt at Tayef, sending, in the ninth year of the Hejra, to make their submission to that prophet, after the keeping of their favourite idol had been denied them, begged, at least, that they might be dispensed with as to their saying of their appointed prayers, he answered, *That there could be no good in that religion wherein was no prayer*.

That so important a duty, therefore, might not be neglected, Mohammed obliged his followers to pray five times every twenty-four hours, at certain stated times; *viz*. 1. In the morning, before sun-rise: 2. When noon is past, and the sun begins to decline from the meridian: 3. In the afternoon, before sun-set: 4. In the evening, after sun-set, and before day be shut in: and, 5. After the day is shut in, and before the first watch of the night. For this institution he pretended to have received the divine command from the throne of God himself, when he took his night-jonrney to heaven; and the observing of the stated times of prayer is frequently insisted on in the Koran, though they be not particularly prescribed therein. Accordingly, at the aforesaid times, of which public notice is given by the Muedhdhins, or Criers, from the steeples of their Mosques, (for they use no bells,) every conscientious Moslem prepares himself for prayer, which he performs either in the Mosque or any other place, provided it be clean, after a prescribed form, and with a certain number of praises or ejaculations, (which the more scrupulous count by a string of beads and using certain postures of worship;) all which have been particularly set down and described, though with some few mistakes, by other writers, and ought not to be abridged, unless in some special cases, as on a journey, on preparing for battle, *&c*.

For the regular performance of the duty of prayer among the Mohammedans, besides the particulars abovementioned, it is also requisite that they turn their faces, while they pray, towards the temple of Mecca; the quarter where the same is situate being, for that reason, pointed out within their mosques by a nich, which they call al Mehrab; and without, by the situation of the doors opening into the galleries of the steeples: there are, also, tables calculated for the ready finding out their Keblah, or part towards which they ought to pray, in places where they have no other direction.

The next point of the Mohammedan religion is the giving of alms; which are of two sorts, *legal* and *voluntary*. The *legal alms* are of indispensable obligation, being commanded by the law, which directs and determines both the portion which is to be given, and of what things it ought to be given; but the *voluntary alms* are left to every one's liberty, to give more or less, as he shall see fit. The former kind of alms some think to be properly called Zacat, and the latter Sadakat; though this name be also frequently given to the legal alms. They are called Zacat, either because they *increase* a man's store by drawing down a blessing thereon, and produce in his soul the virtue of liberality; or because they *purify* the remaining part of one's substance from pollution, and the soul from the filth of avarice; and Sadakat, because they are a proof of a man's sincerity in the worship of God. Some writers have called the legal alms *tithes*, but improperly, since in some cases they fall short, and in others exceed that proportion.

The third point of religious practice is fasting; a duty of so great moment, that Mohammed used to say it was *the gate of religion*, and that *the odour of the mouth of him who fasteth is more grateful to* God *than that of musk*; and al Ghazali reckons fasting *one fourth part of the faith*. According to the Mohammedan divines, there are three degrees of fasting: 1. The restraining the belly and other parts of the body from satisfying their lusts; 2. The restraining the ears, eyes, tongue, hands, feet, and other

ther members from ſin; and, 3. The faſting of the heart from worldly cares, and reſtraining the thoughts from every thing beſides God.

The Mohammedans are obliged, by the expreſs command of the Koran, to faſt the whole month of Ramadan, from the time the new moon firſt appears, till the appearance of the next new moon; during which time they muſt abſtain from eating, drinking, and women, from day-break till night or ſun-ſet. And this injunction they obſerve ſo ſtrictly, that, while they faſt, they ſuffer nothing to enter their mouths, or other parts of their body, eſteeming the faſt broken and null, if they ſmell perfumes, take a clyſter or injection, bathe, or even purpoſely ſwallow their ſpittle: ſome being ſo cautious, that they will not open their mouths to ſpeak, leſt they ſhould breathe the air too freely: the faſt is alſo deemed void, if a man kiſs or touch a woman, or if he vomit deſignedly. But after ſun-ſet they are allowed to refreſh themſelves, and to eat and drink, and enjoy the company of their wives till day-break; though the more rigid begin the faſt again at midnight. This faſt is extremely rigorous and mortifying when the month of Ramadan happens to fall in ſummer, (for, the Arabian year being lunar, each month runs through all the different ſeaſons in the courſe of thirty-three years) the length and heat of the days making the obſervance of it much more difficult and uneaſy than in winter.

The reaſon given why the month of Ramadan was pitched on for this purpoſe is, that on that month the Koran was ſent down from heaven. Some pretend that Abraham, Moſes, and Jeſus, received their reſpective revelations in the ſame month.

The pilgrimage to Mecca is ſo neceſſary a point of practice, that, according to a tradition of Mohammed, he who dies without performing it may as well die a Jew or a Chriſtian; and the ſame is expreſsly commanded in the Koran.

The temple of Mecca ſtands in the midſt of the city, and is honoured with the title of Masjad al elharam, i. e. *the ſacred or inviolable temple*. What is principally reverenced in this place, and gives ſanctity to the whole, is a ſquare ſtone building, called the Caaba, as ſome fancy, from its height, which ſurpaſſes that of the other buildings in Mecca; but more probably from its quadrangular form, and Beit Allah, i. e. the *houſe of* God, being peculiarly hallowed and ſet apart for his worſhip. The length of this edifice, from north to ſouth, is twenty four cubits, its breadth from eaſt to weſt twenty-three cubits, and its height twenty-ſeven cubits: the door, which is on the eaſt ſide, ſtands about four cubits from the ground; the floor being level with the bottom of the door. In the corner next this door is *the black ſtone*. On the north ſide of the Caaba, within a ſemicircular incloſure fifty cubits long, lies the *white ſtone*, ſaid to be the ſepulchre of Iſhmael, which receives the rain water that falls off the Caaba by a ſpout, formerly of wood, but now of gold. The Caaba has a double roof, ſupported within by three octangular pillars of aloes wood; between which, on a bar of iron, hang ſome ſilver lamps. The outſide is covered with rich black damaſk, adorned with an embroidered band of gold, which is changed every year, and was formerly ſent by the Khalifs, afterwards by the Soltans of Egypt, and is now provided by the Turkiſh emperors. At a ſmall diſtance from the Caaba, on the eaſt ſide, is the *ſtation* or *place* of Abraham, where is another ſtone much reſpected by the Mohammedans, of which ſomething will be ſaid hereafter.

The Caaba, at ſome diſtance, is ſurrounded, but not entirely, by a circular incloſure of pillars joined towards the bottom by a low baluſtrade, and towards the top by bars of ſilver. Juſt without this inner incloſure, on the ſouth, north, and weſt ſides of the Caaba, are three buildings, which are the oratories or places where three of the orthodox ſects aſſemble to perform their devotions, (the fourth ſect, *viz.* that of al Shafei, making uſe of the ſtation of Abraham for that purpoſe;) and, towards the ſouth-eaſt, ſtands the edifice which covers the well Zemzem, the treaſury, and the cupola of al Abbas.

All theſe buildings are incloſed, at a conſiderable diſtance, by a magnificent piazza, or ſquare colonnade, like that of the Royal Exchange in London, but much larger, covered with ſmall domes or cupolas; from the four corners whereof riſe as many minarets or ſteeples, with double galleries, and adorned with gilded ſpires and creſcents, as are the cupolas which cover the piazza and the other buildings. Between the pillars of both incloſures hang a great number of lamps, which are conſtantly lighted at night.

This is properly all that is called the temple; but, the whole territory of Mecca being alſo Haram or ſacred, there is a third incloſure diſtinguiſhed at certain diſtances by ſmall turrets, ſome five, ſome ſeven, and others ten miles diſtant from the city. Within this compaſs of ground it is not lawful to attack an enemy, or even to hunt or fowl, or cut a branch from a tree.

The temple of Mecca was a place of worſhip, and in ſingular veneration with the Arabs, from great antiquity, and many centuries before Mohammed. Though it was moſt probably dedicated at firſt to an idolatrous uſe, yet the Mohammedans are generally perſuaded that the Caaba is almoſt coeval with the world.

After this edifice had undergone ſeveral reparations, it was a few years after the birth of Mohammed rebuilt by the Koreiſh on the old foundation, and afterwards repaired by Abd'allah Ebn Zobeir, the Khalif of Mecca; and at length again rebuilt by Yuſof, ſurnamed al Hejaj, in the ſeventy-fourth year of the Hejra, with ſome alterations, in the form wherein it now remains. Some years after, however, the Khalif Harun al Raſhid (or, as others write, his father al Mohdi, or his grandfather al Manſur) intended again to change what had been altered by al Hejaj, and to reduce the Caaba to the old form in which it was left by Abd'allah; but was diſſuaded from meddling with it, leſt ſo holy a place ſhould become the ſport of princes, and, being new-modelled after every one's fancy, ſhould loſe that reverence which was juſtly paid it. But, notwithſtanding the antiquity and holineſs of this building, they have a prophecy, by tradition from Mohammed, that in the laſt times the Ethiopians ſhall come and utterly demoliſh it; after which it will not be rebuilt again for ever.

Before we leave the temple of Mecca, two or three particulars

particulars deferve further notice. One is the celebrated *black ftone*, which is fet in filver, and fixed in the fouth-eaft corner of the Caaba, being that which looks toward Bafra, about two cubits and one third, or, which is the fame thing, feven fpans from the ground. This ftone is exceedingly refpected by the Mohammedans, and is kiffed by the pilgrims with great devotion, being called by fome the *right hand of* God *on earth*. They fable, that it is one of the precious ftones of paradife, and fell down to the earth with Adam, and, being taken up again, or otherwife preferved at the deluge, the angel Gabriel afterwards brought it back to Abraham, when he was building the Caaba. It was at firft whiter than milk, but grew black long fince by the touch of a menftruous woman, or, as others tell us, by the fins of mankind, or rather by the touches and kiffes of fo many people; the fuperficies only being black, and the infide ftill remaining white.

To this temple every Mohammedan, who has health and means fufficient, ought once, at leaft, in his life to go on pilgrimage; nor are women excufed from the performance of this duty. The pilgrims meet at different places near Mecca, according to the different parts from whence they come, during the months of Shawal and Dhu'lkaada; being obliged to be there by the beginning of Dhu'lhajja; which month, as its name imports, is peculiarly fet apart for the celebration of this folemnity.

At the place above-mentioned the pilgrims properly commence fuch; when the men put on the Ihram or facred habit, which confifts only of two woollen wrappers, one wrapped about their middle to cover their privities, and the other thrown over their fhoulders, having their heads bare, and a kind of flippers which cover neither the heel nor the inftep, and fo enter the facred territory in their way to Mecca. While they have this habit on, they muft neither hunt nor fowl, (though they are allowed to fifh;) which precept is fo punctually obferved, that they will not kill even a loufe or a flea, if they find them on their bodies: there are fome noxious animals, however, which they have permiffion to kill during the pilgrimage, as kites, ravens, fcorpions, mice, and dogs given to bite. During the pilgrimage, it behoves a man to have a conftant guard over his words and actions, and to avoid all quarrelling or ill language, and all converfe with women and obfcene difcourfe, and to apply his whole intention to the good work he is engaged in

The pilgrims, being arived at Mecca, immediately vifit the temple, and then enter on the performance of the prefcribed ceremonies which confift chiefly in going in proceffion round the Caaba, in running between the mounts Safa and Merwa, in making the ftation on mount Arafat, and flaying the victims, and fhaving their heads in the valley of Mina.

In compaffing the Caaba, which they do feven times, beginning at the corner where the black ftone is fixed, they ufe a fhort quick pace the three firft times they go round it, and a grave ordinary pace the four laft; which, it is faid, was ordered by Mohammed, that his followers might fhew themfelves ftrong and active, to cut off the hopes of the infidels, who gave out, that the immoderate heats of Medina had rendered them weak. But the aforefaid quick pace they are not obliged to ufe every time they perform this piece of devotion, but only at fome particular times. So often as they pafs by the black ftone, they either kifs it, or touch it with their hand, and kifs that.

The running between Safa and Merwa is alfo performed feven times, partly with a flow pace, and partly running: for they walk gravely till they come to a place between two pillars; and there they run, and afterwards walk again; fometimes looking back, and fometimes ftopping, like one who has loft fomething, to reprefent Hagar feeking water for her fon; for the ceremony is faid to be as ancient as her time.

On the ninth of Dhu'lhajja, after morning prayer, the pilgrims leave the valley of Mina, whither they come the day before, and proceed in a tumultuous and rufhing manner to mount Arafat, where they ftay to perform their devotions till fun-fet: then they go to Mozdalifa, an oratory between Arafat and Mina; and there fpend the night in prayer, and reading the Koran. The next morning by day-break they vifit al Mafher al haram, or the *facred monument*, and, departing thence before funrife, hafte by Batn Mohaffer to the valley of Mina, where they throw feven ftones at three marks or pillars, in imitation of Abraham, who, meeting the devil in that place, and being by him difturbed in his devotions, or tempted to difobedience, when he was going to facrifice his fon, was commanded by God to drive him away by throwing ftones at him; though others pretend this rite to be as old as Adam, who alfo put the devil to flight in the fame place and by the fame means.

This ceremony being over, on the fame day, the tenth of Dhu'lhajja, the pilgrims flay their victims in the faid valley of Mina; of which they and their friends eat part, and the reft is given to the poor. Thefe victims muft be either fheep, goats, kine, or camels; males, if of either of the two former kinds; and females, if of either of the latter; and of a fit age. The facrifices being over, they fhave their heads and cut their nails, burying them in the fame place; after which the pilgrimage is looked on as completed; though they again vifit the Caaba, to take their leave of that facred building.

MAIDEN, an inftrument ufed in Scotland for beheading criminals.

This is a broad piece of iron, about a foot fquare, very fharp on the lower part, and loaded above with a very heavy weight of lead. At the time of execution it is pulled up to the top of a narrow wooden frame, about ten feet high, and as broad as the engine, with mouldings on each fide for the maiden to flide in. A convenience is made about four feet from the ground, for the prifoner to lay his neck; and there is a kind of bar fo faftened as to keep him from ftirring. The prifoner being thus fecured, and the fign given, the maiden is let loofe, which in a moment feparates his head from his body.

MAIDSTONE, the county-town of Kent, fituated on the Medway, twenty-two miles weft of Canterbury: E. long. 37', N. lat. 51° 20'. It fends two members to parliament.

MAJESTY,

MAJESTY, a title given to kings, which frequently ferves as a term of diftinction.

Thus the emperor is called Sacred Majefty, Imperial Majefty, and Cæfarian Majefty; the king of France is called his Moft Chriftian Majefty, and when he treats with the emperor, the word Sacred is added; and the king of Spain is termed his Moft Catholic Majefty: with refpect to other kings, the name of the kingdom is added, as his Britannic Majefty, his Polifh Majefty, *&c* Formerly princes were more fparing in giving titles. and more modeft in claiming them: before the reign of Charles V. the kings of Spain had only the title of Highnefs; and before that of Henry VIII. the kings of England were only addreffed under the title of Grace and Highnefs.

MAIL, or *coat of* MAIL, a piece of defenfive armour for the body, made of fmall iron rings, interwoven in the manner of a net.

Action of MAILS *and Duties*, in Scots law. See LAW, Tit. xxx. 20.

MAINE, a river of Germany, which rifes on the eaft fide of the circle of Franconia and running from eaft to weft, difcharges itfelf into the Rhine at Mentz.

MAINPRISE, in law, is the receiving a perfon into friendly cuftody, who might otherwife be committed to prifon, on fecurity given that he fhall be forthcoming at a certain time and place appointed.

MAJOR, in the art of war, the name of feveral officers of very different ranks and functions; as 1. Major-general, the next officer to the lieutenant general: his chief bufinefs is to receive the orders from the general, or in his abfence from the lieutenant general of the day; which he is to diftribute to the brigade-majors, with whom he is to regulate the guards, convoys, and detachments. When there are two attacks at a fiege, he commands that on the left. He ought to be well acquainted with the ftrength of each brigade of each regiment in particular, and to have a lift of all the field officers. In fhort, he is in the army what a major is in a regiment. He is allowed an aid de camp, and has a ferjeant and fifteen men for his guard. 2. Major of a brigade, the officer who receives the orders from the major-general, and afterwards delivers them to the adjutants of the regiments at the head of the brigade; where he takes and marches the detachments, *&c* to the general rendezvous. He ought to be an expert captain, to know the ftate and condition of the brigade, and keep a roll of the colonels, lieutenant-colonels, majors, and adjutants 3. Major of a regiment, the next officer to the lieutenant-colonel, generally promoted from the oldeft captain. He is to take care that the regiment be well exercifed, to fee it march in good order, and to rally it in cafe of its being broke. He is the only officer among the foot that is allowed to be on horfeback in time of action, that he may the more readily execute the colonel's orders, either in advancing or drawing off the regiment. 4. Major of a regiment of horfe, is the firft captain, who commands in the abfence of the colonel. 5. Town-major, the third officer in a garrifon, being next to the deputy-governor. He ought to underftand fortification, and hath charge of the guards, rounds, patrols, *&c.* His bufinefs is alfo to take care that the foldiers arms are in good order; he likewife orders the gates to be opened and fhut, and gives the governor an account of all that paffes within the place

There are alfo aids major, drums-major, *&c* fo called from their preheminence above others of the fame denomination.

MAJOR, in logic, the firft propofition of a fyllogifm. See LOGIC.

MAJORANA in botany See ORIGANUM.

MAJORCA, the capital of a Spanifh ifland of the fame name: E. long. 2° 30′, N. lat 39° 30′

This ifland is in the Mediterranean fea, about fixty miles long, and forty five broad, fituated about eighty miles fouth of the coaft of Catalonia, and an hundred miles eaft of Valencia

MAIRE. or *ftreights of Le* MAIRE, is a paffage to Cape Horn, fituated between Terra del Fuego in South America, and Statten ifland; which being difcovered by Le Maire, obtained his name.

MAIZ. See ZEA

MALA, the cheek, in anatomy. See ANATOMY, p. 160.

MALABAR, the fouth weft coaft of the peninfula of hither India, about 400 miles long, and 100 broad, bounded by Vifapour on the north; by the mountains of Baligate, on the eaft; and by the Indian ocean on the weft and fouth.

MALACCA, the moft foutherly part of the further peninfula of India, about 600 miles long, and generally about 200 miles broad; bounded by Siam, on the north; by the bay of Siam and the Indian ocean, on the eaft; and by the ftreights of Malacca, on the fouth-weft. The capital of this country, which is alfo commonly called Malacca, is fituated in 100° of E. long. and 2° 30′ N. lat.

MALACHI, or *the prophecy of* MALACHI, a canonical book of the old Teftament, and the laft of the twelve leffer prophets. Malachi prophefied about three hundred years before Chrift, reproving the Jews for their wickednefs after their return from Babylon, charging them with rebellion, facrilege, adultery, prophanenefs, and infidelity, and condemning the priefts for being fcandaloufly carelefs in their miniftry: at the fame time not forgetting to encourage the pious few, who, in that corrupt age, maintained their integrity. This prophet diftinctly points at the Meffiah, who was fuddenly to come to his temple, and to be introduced by Elijah the prophet. that is, by John the Baptift, who came in the fpirit and power of Elias or Elijah.

MALACIA, in medicine, is a languifhing diforder incident to pregnant women, in which they long fometimes for one kind of food, and fometimes for another, and eat it with an extraordinary greedinefs.

MALACOPTERYGIOUS, among ichthyologifts, an appellation given to fuch fifhes as have the rays of their fins bony, but not pointed or fharp at the extremities, like thofe of acanthopterygious fifhes.

MALACOSTOMOUS FISHES, thofe deftitute of teeth in the jaws, called in Englifh leather-mouthed; as the tench, carp, bream, *&c.*

MALAGA, a city and port of Spain, in the province of Granada, situated in the Mediterranean, sixty-six miles north-east of Gibraltar: W. long. 4° 45′, N. lat. 36° 40′.

MALAGMA, a cataplasm. See CATAPLASM.

MALAMOCCA, a small island and port-town in the lagunes of Venice, situated five miles south of that city.

MALDIVA-ISLANDS, are about a thousand small islands in the Indian ocean, 500 miles south-west of the continent of the hither India, extending from the second degree of south latitude, to the seventh degree of north latitude.

MALDON, a port-town of Essex, ten miles east of Chelmsford. It sends two members to parliament.

MALE, among zoologists, that sex of animals which has the parts of generation without the body.

MALIGNANT, among physicians, a term applied to diseases of a very dangerous nature, and generally infectious: such are the dysentery, hospital-fever, *&c.* in their worst stages.

MALL, or SEA-MALL, in ornithology. See LARUS.

MALLEABLE, a property of metals, whereby they are capable of being extended under the hammer.

MALLEUS, in anatomy. See ANATOMY, p. 297.

MALLOW, in botany. See MALVA.

MALMSBURY, a borough town of Wiltshire, thirty miles south-west of Salisbury: it sends two members to parliament.

MALO, or *St* MALO, a city and port-town of France, in the province of Britany, situated on a rock, in the English channel, but joined to the continent by a causeway: W. long. 2°, N. lat. 48° 40′.

MALOPE, in botany, a genus of the monadelphia polyandria class. It has a double calix, the exterior one having three leaves; and the capsule contains but one seed. There is only one species, a native of Mauritania.

MALPIGHIA, in botany, a genus of the decandria trigynia class. The calix consists of five leaves, and the corolla of five roundish petals; and the berry has one cell and three seeds. There are nine species, none of them natives of Britain.

MALPLAQUET, a village in the Austrian Netherlands, in the province of Hainault, about seven miles from Mons.

MALT. See BREWING.

MALTA, the capital of a small island of the same name in the Mediterranean, is situated in E. long. 15°, N. lat. 35° 15′; consisting of three towns, separated by channels, which form so many peninsulas of solid rock, rising a great height above the sea.

Knights of MALTA, otherwise called *Hospitalers of St. John of Jerusalem*, a religious military order, whose residence is in the island of Malta. The order consists of three estates, the knights, chaplains, and servants at arms: there are also priests who officiate in the churches; friar-sevants, who assist at the offices; and donnes, or demicrosses; but these are not reckoned constituent parts of the body. The government of the order is mixt, being partly monarchical, and partly aristocratical: the grand master is sovereign. The knights formerly consisted of eight different languages, but now only seven, the English having withdrawn themselves. None are admitted into this order but such as are of noble birth: the knights are of two sorts, those who have a right to be candidates for the dignity of grand master, called grand crosses, and those who are only knights assistants: they never marry, yet have continued from 1090 to the present time. The knights are received into this order, either by undergoing the trials prescribed by statutes, or by dispensation.

MALTON, a borough of Yorkshire, situated on the river Derwent, twenty miles north-east of York. It sends two members to parliament.

MALVA, in botany, a genus of the monadelphia polyandria class. The calix is double, the exterior one consisting of three leaves; and there are many capsules, containing each one seed. There are 22 species, five of them natives of Britain, *viz.* the sylvestris, or common mallow; the rotundifolia, or dwarf mallow; the parviflora, or small flowered mallow; the alcea, or vervain mallow; and the moschata, or jagged-leaved vervain mallow. The leaves of the mallow are emollient.

MALUS, in botany. See PYRUS.

MAMALUKES, the name of a dynasty that reigned in Egypt.

The Mamalukes were originally Turkish and Circassia-slaves, bought of the Tartars by Melicsaleh, to the number of a thousand, whom he bred up to arms, and raised some to the principal offices of the empire. They killed sultan Moadam, to whom they succeeded.

Others say, that the mamalukes were ordinarily chosen from among the Christian slaves, and that they were the same thing in a great measure with the Janissaries among the Turks. They never married. They first are said to have been brought from Circassia, and some have supposed that they began to reign about the year 869.

MAMMÆ, in anatomy. See ANATOMY, p. 277.

MAMMEA, in botany, a genus of the polyandria monogynia class. The corolla consists of four petals, and the calix of two leaves; and the berry is large, and contains four seeds. There are two species, none of them natives of Britain.

MAN, in zoology. See HOMO.

MANCHESER, a large town of Lancashire, forty miles south-east of Lancaster.

MANDAMUS, in law, a writ that issues out of the court of king's bench, sent to a corporation, commanding them to admit or restore a person to his office.

MANDARINS, a name give to the magistrates and governors of provinces in China, who are chosen out of the most learned men, and whose government is always at a great distance from the place of their birth. Mandarin is also a name given by the Chinese to the learned language of the country; for besides the language peculiar to every province, there is one common to all the learned in the empire, which is in China what Latin is in Europe; this is called the mandarin tongue, or the language of the court.

MANDATE, in law, a judicial commandment to do something. See MANDAMUS.

MANDATE, in Scots law. See LAW, Tit. xxii. 9.

MAN-

MANDERSCHEIT, a city of Germany, in the electorate of Triers, and the capital of the county of Manderscheit: E. long. 6° 32′, N. lat. 50° 20′.

MANDRAGORA, in botany. See ATROPA.

MANE, the hair hanging down from a horſe's neck; which ſhould be long, thin, and fine; and if frizzled, ſo much the better.

MANEGE, or MANAGE, the exerciſe of riding the great horſe, or the ground ſet apart for that purpoſe; which is ſometimes covered, for continuing the exerciſe in bad weather; and ſometimes open, in order to give more liberty and freedom both to the horſeman and horſe. See HORSEMANSHIP.

MANES, in the pagan ſyſtem of theology, a general name for the infernal deities, or gods of hell.

The ancients comprehended under manes not only Pluto, Proſerpine, and Minos, but the ſouls likewiſe of the deceaſed were taken into the number, and eſteemed gods of hell. It was uſual to erect altars and offer libations to the manes of deceaſed friends and relations. One branch of the magic art among the pagans conſiſted in conſulting the manes of the dead in matters of importance: this was called Necromancy. See NECROMANCY.

MANGIFERA, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of five petals; and the drupa is ſhaped like a kidney. There is but one ſpecies a native of Britain

MANHEIM, a city of Germany, in the palatinate of the Rhine, ſituated at the confluence of the Rhine and Neckar: E. long. 7° 20′, N. lat. 49° 30′.

MANIA, in medicine. See MEDICINE.

MANICHEES, in church-hiſtory, a ſect of Chriſtian heretics in the third century, the followers of Manes, who made his appearance in the reign of the emperor Probus; pretending to be the comforter whom our Savious promiſed to ſend into the world. He taught that there are two principles, or gods, coeternal and independant on each other, the one the author of all evil, and the other of all good; a doctrine which he borrowed from the Perſian magi. He held that our ſouls we made by the good principle, and our bodies by the evil one; and that the ſouls of his followers paſſed through the elements to the moon, and from thence to the ſun; where being purified, they then went to God, and became united with his eſſence; but as for the ſouls of other men, they either went to hell, or were united to other bodies. He alledged, that Chriſt had his reſidence in the ſun, the Holy Ghoſt in the air, wiſdom in the moon, and the Father in the abyſs of light. He is alſo charged with denying the reſurrection and condemning marriage; with teaching that Chriſt was the ſerpent that tempted Eve; with forbidding the uſe of eggs, cheeſe, milk, and wine, as proceeding from the bad principle; with uſing a different kind of baptiſm from that of the church; with teaching that magiſtrates were not to be obeyed; and with condemning the moſt lawful wars.

MANICORDON, or MANICHORD, a muſical inſtrument in the form of a ſpinet; the ſtrings of which, like thoſe of the clarichord, are covered with little pieces of cloth, to deaden was well as to ſoften their ſound; whence it is alſo called the dumb ſpinet.

MANIFESTO, a public declaration made by a prince in writing, ſhewing his intentions to begin a war, or other enterprize, with the motives that induce him to it, and the reaſons on which he founds his rights and pretenſions.

MANILLE, in commerce, a large braſs-ring in the form of a bracelet, either plain or engraven, flat or round.

Manilles are the principal commodities which the Europeans carry to the coaſt of Africa, and exchange with the natives for ſlaves. Theſe people wear them as ornaments on the ſmall of the leg, and on the thick part of the arm above the elbow. The great men wear manilles of gold and ſilver, but theſe are made in the country by the natives themſelves.

MANIPULUS, in Roman antiquity, a body of infantry, conſiſting of two hundred men, and conſtituting the third part of a cohort.

MANIS, the SCALY LIZARD, in zoology, a genus of quadrupeds, belonging to the order of Bruta, the characters of which are theſe: They have no fore-teeth either in the upper or under jaw; the tongue is long and cylindrical: the ſnout is long and narrow; and the body is covered with hard ſcales. There are two ſpecies, *viz.*

1. The pentadactyla, or ſcaly lizard with five toes on each foot. The head is ſmaller than the neck; the eyes are very ſmall; the length of the body, including the tail, is from ſix to eight feet. The whole body is covered with hard ſcales, excepting the under part of the head and neck, the breaſt, the belly, and the internal ſide of each leg. Betwixt the ſcales of this animal, there are ſome hard hairs like the briſtles of a hog, browniſh at the points. The ſcales are of a reddiſh colour, very hard, convex above, and concave below. All the parts which want ſcales are naked. The ſcales are unconnected, and the animal can raiſe or lower them at pleaſure like the quills of the porcupine. When irritated, he erects his ſcales, and rolls himſelf up like a hedge-hog. In this ſituation, neither the tiger, the lion, nor any other animal, is able to hurt him. This creature has nothing forbidding about him but his figure. He is mild and inoffenſive, feeding on nothing but worms and other inſects. His motion is ſlow; and he has no other method of eſcaping the purſuit of man, but by concealing himſelf in crannies of rocks, and in holes which they dig in the ground, where they likewiſe bring forth their young. This animal is a native of the Eaſt Indies; and are ſo few in number, that they are ſeldom to be met with.

2. The tetradactyla, or ſcaly lizard with four toes on each foot. This ſpecies is very ſimilar to the former; only the tail is much longer in proportion to the body, and ſuch parts as want ſcales, inſtead of being naked, are covered with a ſoft hair. It is likewiſe found in the Eaſt Indies. See Plate CIV. fig. 4.

MANNA, in the materia medica, the concreted juice of ſome vegetable, naturally exſudating from it, ſoluble in water, and not inflammable.

It is a honey-like juice, brought to us from Calabria and

and Sicily, ſometimes in ſmall granules, or drops of an irregular figure, roundiſh, oblong, crooked, and ſometimes contorted. It ſhould be choſen whitiſh, or at the utmoſt with only a faint caſt of yellow, not too heavy, in regular dry granules, or in moderately long ſtriæ or flakes, of a pleaſant taſte, and diſſolving wholly in the mouth, not leaving a farinacious ſubſtance behind it, as much of the common manna does that has been adulterated with honey and flour.

Manna is the mildeſt and ſafeſt of all purges, and may be given to children, to women with child and to people of the moſt tender conſtitutions, with perfect ſafety; and it never fails gently to move the bowels.

MANOR, an ancient royalty or lordſhip, formerly called a barony, conſiſting of demeſnes, ſervices, and a court-baron; and comprehending in it meſſuages, lands, meadow, paſture, wood, rents, an advowſon, *&c.* It may contain one or more villages or hamlets, or only a great part of a village, *&c*

MANS, the capital of the territory of Maine, in the province of Orleanois in France: E. long. 5′, N lat. 48° 6′

MANSFIELD, a city of Germany, the capital of a county of the ſame name, in the circle of Upper Saxany: E. long. 11° 45′. N. lat. 51° 36′.

MANSION, in law, is the chief dwelling houſe of a lord within his fee, or the capital meſſuage or manor-houſe.

MANSLAUGHTER, generally termed homicide, is killing a perſon without permeditated malice.

MANTELETS, in the art of war, a kind of moveable parapets, made of planks about three inches thick, nailed one over another, to the height of almoſt ſix feet, generally caſed with tin and ſet upon little wheels, ſo that in a ſiege they may be driven before the pioneers, and ſerve as blinds to ſhelter them from the enemy's ſmall ſhot.

MANTLE, or MANTLE TREE, in architecture, the lower part of the chimney, or that piece of timber which is laid acroſs the jaumbs, and ſuſtains the compartment of the chimney piece.

MANTLE, or MANTLING in heraldry, that appearance of folding of cloth flouriſhing, or drapery, that is in any atchievement drawn about the coat of arms. It is ſuppoſed originally to be the repreſentation of a mantle, or military habit, worn by the ancient cavaliers over their armour to preſerve it from ruſt; or, as others hold, a ſhort covering only worn over the helmet, which in after-times was lengthened, and made to hang from the helmet below the whole ſhield. See Plate CX. fig 1.

MANTUA, the capital of a duchy of the ſame name in Italy, is ſituated in the middle of a lake, formed by the river Mincio, but has a communication with the continent by three cauſeways: E. long. 11° 15′, N. lat. 45° 20′

MANUMISSION, in Roman antiquity, the act of ſeting a ſlave at liberty; which was uſually performed before the prætor, who laid his wand called vindicta, on the ſlave's head, and declared him free

MANUFACTURER, one who works up a natural product into an artificial commodity.

MANURE, any thing uſed for fattening and improving land. See AGRICULTURE, p. 47.

MANUSCRIPT, in matters of literature, denotes a written book, in contradiſtinction to a printed one. See BOOK.

MAP, a plain figure, repreſenting the ſurface of the earth, or a part thereof, according to the laws of perſpective. See GEOGRAPHY.

MAPLE, in botany. See ACER.

MAPPARIUS, in Roman antiquity, the officer who gave the ſignal to the gladiators to begin fighting; which he did by throwing an handkerchief that he had received from the emperor or other magiſtrate.

MARANTA, in botany, a genus of the monandria monogynia claſs. The corolla is ringent, and conſiſts of five ſegments. There are two ſpecies, none of them natives of Britain.

MARASMUS, among phyſicians, denotes an atrophy or conſumption, in its laſt and moſt deplorable ſtage.

MARBLE in natural hiſtory, a genus of foſſils; being bright and beautiful ſtones, compoſed of ſmall ſeparate concretions, moderately hard, not giving fire with ſteel, fermenting with and ſoluble in acid menſtrua, and calcining in a ſlight fire.

The colours of marbles being a very obvious and ſtriking character, they are arranged according to them in the following diviſions. 1. Of the white plain marbles there are two ſorts; the Parian marble of the ancients, and ſtatuary marble of the moderns, an extremely bright and elegant marble; and the Carara marble, a very fine marble, more compact and cloſe than the former, but leſs bright. 2. Of the plain yellowiſh marbles there is only one ſort, which is a hard, pale yellow, and gloſſy marble, found in many parts of Italy. 3. Of the bluiſh and black marbles there are a great many ſpecies, as the Chian marble, baſaltes, *&c.* 4. Of the plain green marbles there is only one kind the Lacedemonian marble of the ancients. 5. The pale coloured or whitiſh brown, commonly called Darby-marble. 6. The green marbles with ſhells 7. The black coralloide marble, with and without ſhells. 8. Of the white variegated marbles there are a great many ſpecies, variegated with purple, brown, red, blue, *&c.* 9. Of the brown variegated marbles there are likewiſe ſeveral ſorts, ſome with red veins, others with white, black, or brown veins. 10. Of the yellow-veined and variegated marbles, ſome are veined with purple, and others with blue. 11. Of the black variegated marbles, ſome are veined with white, and others with blue, yellow, red, *&c* 12. The green variegated marbles are likewiſe diſtinguiſhed by the colour of their veins. 13. The gray ſpotted marbles are variegated, ſome with black, and others with green ſpots. 14. The red variegated marble is the brocatello of the Italians, with white and gold veins

Colouring of MARBLE. The colouring of marbles is a nice art; and in order to ſucceed in it, the pieces of marble on which the experiments are tried muſt be well poliſhed, and clear from the leaſt ſpot or vein. The harder the marble is, the better it will bear the heat neceſſary in the operation; therefore alabaſter, and

and the common ſoft white marble, are very improper to perform theſe operations upon.

Heat is always neceſſary for the opening the pores of the marble, ſo as to render it fit to receive the colours: but it muſt never be made red hot; for then the texture of the marble itſelf is injured, and the colours are burnt, and loſe their beauty. Too ſmall a degree of heat is as bad as too great; for, in this caſe tho' the marble receive the colour, it will not be fixed in it, nor ſtrike deep enough. Some colours will ſtrike, even cold; but they are never ſo well ſunk in as when a juſt degree of heat is uſed. The proper degree is that which, without making the marble red, will make the liquor boil upon its ſurface. The menſtruums uſed to ſtrike in the colours muſt be varied according to the nature of the colour to be uſed. A lixivium made with horſe's or dog's urine, with four parts quick lime, and one part pot-aſhes, is excellent for ſome colours; common lye of wood-aſhes does very well for others: for ſome, ſpirit of wine is beſt; and finally, for others, oily liquors, or common white-wine.

The colours which have been found to ſucceed beſt with the peculiar menſtruums, are theſe: ſtone blue diſſolved in ſix times the quantity of ſpirit of wine, or of the urinous lixivium; and that colour which the painters call litmous, diſſolved in common lye of wood-aſhes. An extract of ſaffron, and that colour made of buckthorn-berries, and called by the painters ſap-green, both ſucceed well diſſolved in urine and quick-lime and tolerably well in ſpirit of wine. Vermillion, and a fine powder of cochineal, ſucceed alſo very well in the ſame liquors. Dragon's blood ſucceeds very well in ſpirit of wine, as does alſo a tincture of logwood in the ſame ſpirit. Alkanet root gives a fine colour, but the only menſtruum to be uſed for this is oil of turpentine; for neither ſpirit of wine, nor any lixivium, will do with it. There is another kind of ſanguis draconis, called dragon's blood in tears, which, mixed with urine alone, gives a very elegant colour. Beſides theſe mixtures of colours and menſtruums, there are ſome colours which are to be laid on dry and unmixed. Theſe are dragon's blood, of the pureſt kind, for a red; gamboge for a yellow; green wax for a green; common brimſtone, pitch, and turpentine, for a brown colour. The marble, for theſe experiments, muſt be made conſiderably hot, and then the colours are to be rubbed on dry in the lump. Some of theſe colours, when once given, remain immutable; others are eaſily changed or deſtroyed. Thus the red colour given by dragon's blood, or by a decoction of logwood, will be wholly taken away by oil of tartar, and the poliſh of the marble not hurt by it.

A fine gold colour is given in the following manner: take crude ſal armoniac, vitriol, and verdegreaſe, of each equal quantities; white vitriol ſucceeds beſt; and all muſt be thoroughly mixed in fine powder.

The ſtaining of marble to all the degrees of red or yellow, by ſolutions of dragon's blood or gamboge, may be done by reducing theſe gums to powder, and grinding them, with the ſpirit of wine, in a glaſs mortar; but for ſmaller attempts, no method is ſo good, as the mixing a little of either of theſe powders with ſpirit of wine in a ſilver ſpoon, and holding it over burning charcoal. By this means a fine tincture will be extracted; and with a pencil dipped in this, the fineſt traces may be made on the marble while cold, which, on the heating it afterwards either on ſand, or in a baker's oven, will all ſink very deep, and remain perfectly diſtinct in the ſtone. It is very eaſy to make the ground colour of the marble red or yellow by this means, and leave white veins in it. This is to be done by covering the places where the whiteneſs is to remain with ſome white paint, or even with two or three doubles only of paper, either of which will prevent the colour from penetrating in that part. All the degrees of red are to be given to marble by means of this gum alone; a ſlight tincture of it, without the aſſiſtance of heat to the marble, gives only a pale fleſh colour, but the ſtronger tinctures give it yet deeper; to this the aſſiſtance of heat adds yet greatly; and finally, the addition of a little pitch to the tincture gives it a tendency to blackneſs, or any degree of deep red that is deſired. A blue colour may be given alſo to marble by diſſolving turnſol in a lixivium of lime and urine, or in the volatile ſpirit of urine; but this has always a tendency to purple, whether made by the one or the other of theſe ways. A better blue, and uſed in an eaſier manner, is furniſhed by the Canary turnſol, a ſubſtance well known among the dyers; this needs only to be diſſolved in water, and drawn on the place with a pencil: this penetrates very deep into the marble, and the colour may be increaſed by drawing the pencil wetted afreſh ſeveral times over the ſame lines. This colour is ſubject to ſpread and diffuſe itſelf irregularly; but it may be kept in regular bounds, by circumſcribing its lines with beds of wax, or any other ſuch ſubſtance.

Poliſhing of MARBLES is performed by firſt rubbing them well with a free-ſtone, or ſand till the ſtrokes of the axe are worn off, then with pumice ſtone, and afterwards with emery.

Arundel-MARBLES, ancient marbles with a chronicle of the city of Athens inſcribed on them, many years before our Saviour's birth; preſented to the univerſity of Oxford by Thomas earl of Arundel, whence the name.

MARBLING, in general, the painting any thing with veins and clouds, ſo as to repreſent thoſe of marble.

Marbling of books or paper is performed thus: Diſſolve four ounces of gum arabic into two quarts of fair water; then provide ſeveral colours mixed with water in pots or ſhells, and, with pencils peculiar to each colour, ſprinkle them by way of intermixture upon the gum-water, which muſt be put into a trough or ſome broad veſſel; then with a ſtick curl them, or draw them out in ſtreaks, to as much variety as may be done. Having done this, hold your book or books cloſe together, and only dip the edges in, on the top of the water and colours very lightly; which done, take them off, and the plain impreſſion of the colours in mixture will be upon the leaves; doing as well the ends as the front of the book in the like manner.

After the ſame manner you may make marbled paper,

per, by dipping it on the flat, as alſo linnen cloth, &c.

Marbling a book on the covers is performed by forming clouds with aqua fortis, or ſpirit of vitriol mixed with ink, and afterwards glazing the covers.

MARCASITES, in natural hiſtory, are defined to be compound inflammable metallic bodies, of a hard and ſolid ſubſtance, of an obſcurely and irregularly foliaceous ſtructure, of a bright glittering appearance, naturally conſtituting whole ſtrata, though ſometimes found in detached maſſes; very freely giving fire with ſteel; not fermenting with acid menſtruums; and when put into the fire, yielding a blue ſulphureous flame, and afterwards calcining into a purple powder. There are only three known ſpecies of this genus: 1. The ſilver-coloured marcaſite, found in vaſt abundance in lead and tin mines. 2. The gold-coloured marcaſite. 3. The heavy pale-white marcaſite.

Marcaſites were at firſt ſuppoſed to be almoſt all pure gold or ſilver, according to their colour; but experience has ſhewn, that if they contain any metal at all, no method has hitherto been found of working them to advantage. In Germany, indeed, they extract ſulphur and vitriol from the ſilver marcaſite, which two ſubſtances are always contained in it; and beſides theſe, it has uſually a quantity of arſenic. It has been recommended as a ſtyptic, after being calcined: but as the arſenic may not be all carried off by that operation, its uſe as a medicine ſeems extremely dangerous.

MARCGRAVE, or MARGRAVE, a degree of honour in Germany anſwering to our marquis.

MARCGRAVIA, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of one petal, and the calix conſiſts of ſix imbricated leaves; and the berry has one cell, containing many ſeeds. There is but one ſpecies, a native of America.

MARCH, in chronology, the third month of the year, conſiſting of thirty-one days.

MARCHANTIA, in botany, a genus of the cryptogamia algæ claſs. The calix of the male is peltated, and covered below with monopetalous corollæ; the calix of the female is ſeſſile, bell-ſhaped, and contains many ſeeds. There are eight ſpecies, four of them natives of Britain, viz. the polymorphia, or common marchantia; the cruciata, or croſs-headed marchantia; the hemiſphærica, or marſh marchantia; and the conica, or wart marchantia.

MARCHE, a territory of Lyonois, in France, having Berry on the north, Burbonois and Auvergne on the eaſt, Limoſin on the ſouth, and Poictou on the weſt.

MARCHPURG, a town of Germany, in the circle of Auſtria and duchy of Stiria: W. long. 15° 50′, N. lat. 47°.

MARCIONITES, Chriſtian heretics in the IId century, thus denominated from their leader Marcion, who maintained, that there were two principles or gods, a good and a bad one.

MARCOSIANS, a ſect of Chriſtian heretics in the IId century, ſo called from their leader Marcus, who repreſented the ſupreme God as conſiſting not of a trinity, but a quaternity, *viz.* the ineffable, ſilence, the father, and truth.

MARE, the female of the horſe kind. See EQUUS.

MARGARETTA, one of the largeſt of the Leeward-iſlands; it is about fifty miles long, and twenty-four broad, and ſituated ſixty miles north of the continent of Paria, or New Andaluſia, in South America: W. long. 64°, and N. lat. 11° 30′.

MARGARITA, the PEARL, in natural hiſtory. See PEARL.

MARGATE, a port-town of Kent, in the iſle of Thanet, 12 miles north of Deal.

MARIGNAN, a city and port-town of Brazil, the capital of the captainſhip of Marignan, ſituated at the mouth of the river St Mary: W. lon. 44°, and S. lat. 2° 15′.

MARINER, the ſame with ſailor. See SAILOR.

MARINO, a city of Italy, in the duchy of Urbino, the capital of the territory of Marino, a little ſtate or commonwealth, ſituated on a mountain in the middle of the Pope's territories: E. long. 13° 30′, and N. lat. 44°.

MARJORAM, in botany. See ORIGANUM.

MARITIME, ſomething related to, or bounded by the ſea: thus, a maritime province, or country, is one bounded by the ſea; and a maritime kingdom, or ſtate, is one that makes a conſiderable figure, or is very powerful at ſea. Hence, by maritime powers, among the European ſtates, are underſtood Great Britain and Holland.

St MARK *the evangeliſt's day*, a feſtival of the Chriſtian church, obſerved April 25.

St MARK's *Goſpel*, a canonical book of the New Teſtament, being one of the four goſpels.

St Mark wrote his goſpel at Rome, where he accompanied St Peter, in the year of Chriſt 44. Tertullian and others pretend that St Mark was no more than an amanuenſis to St Peter, who dictated this goſpel to him; others affirm, that he wrote it after St Peter's death. Nor are the learned leſs divided as to the language this goſpel was wrote in; ſome affirming it was compoſed in Greek, others in Latin. Several of the ancient heretics received only the goſpel of St Mark: others among the catholics rejected the twelve laſt verſes of this goſpel. The goſpel of St Mark is properly an abridgment of that of St Matthew.

Canons of St MARK, a congregation of regular canons, founded at Mantua, by Albert Spinola a prieſt, towards the end of the XIIth century. Spinola made a rule for them, which was approved, corrected, and confirmed by ſeveral ſucceeding popes. About the year 1450, they were reformed, and followed only the rule of St Auguſtine. This congregation having flouriſhed for the ſpace of four hundred years, declined by little and little, and is now become extinct.

Knights of St MARK, an order of knighthood in the republic of Venice, under the protection of St Mark the evangeliſt. The arms of the order are, gules, a lion winged, or, with this device, PAX TIBI MARCE EVANGELISTA. This order is never conferred but on thoſe

those who have done signal service to the commonwealth.

Mark, or Marc, also denotes a weight used in several states of Europe, and for several commodities, especially gold and silver. In France, the mark is divided into 8 ounces, or 64 drachms, or 192 derniers or penny weights, or 160 esterlines, or 300 mails, or 640 felins, or 4608 grains. In Holland the mark-weight is also called troy weight, and is equal to that of France. When gold and silver are sold by the mark, it is divided into 25 carats.

Mark is also used among us for a money of account, and in some other countries for a coin.

The English mark is two thirds of a pound sterling, or 13s. 4d. and the Scotch mark is of equal value in Scotch money of account.

MARKET, a public place in a city or town, in which live cattle, provisions, or other goods, are set to sale; and also a privilege, either by grant or prescription, by which a town is enabled to keep a market.

MARLBRO, or Marlborough, a borough-town of Wiltshire, eighteen miles north of Salisbury.

It sends two members to parliament.

Marlbro'-fort, an English factory on the west coast of the island of Sumatra, three miles east of Bencoolen: E. long. 101°, and S. lat. 4° 15′.

MARLE. See Agriculture, p. 48.

MARLOW, a borough town of Buckinghamshire, fifteen miles south of Ailesbury. It sends two members to parliament.

MARMALADE, a confection of plumbs, apricots, quinces, *&c.* boiled with sugar to a consistence.

MARMOR. See Marble.

MARMORA, a little island of Turky, situated in the sea of Marmora, to which it gives name, lying sixty miles south-west of Constantinople.

MARMOTTE, in zoology. See Mus.

MAROSCH, or Merish, a great river, which, rising in the Carpathian mountains, runs through Transilvania and Hungary, and falls into the river Teyse at Segedin.

MARPURG, a city of Germany, forty miles north of Francfort: E. long. 8°, 40′, and N. lat. 50° 40′.

MARQUE, or *letters of* Marque, in military affairs, are letters of reprisal, granting the subjects of one prince or state liberty to make reprisals on those of another.

Letters of marque among us, are extraordinary commissions granted by authority for reparation to merchants, taken and despoiled by strangers at sea; and reprisals is only the retaking, or taking of one thing for another.

MARQUETRY, or Inlaid-work, is a curious work composed of several fine hard pieces of wood, of various colours, fastened in thin slices on a ground, and sometimes enriched with other matters, as silver, brass, tortoise-shell, and ivory: with these assistances the art is now capable of imitating any thing; whence it is by some called the art of painting in wood.

MARQUIS, a title of honour, next in dignity to that of duke, first given to those who commanded the marches, that is, the borders and frontiers of countries.

MARR, that part of Aberdeenshire situated between the rivers Dee and Don.

MARRIAGE, a contract both civil and religious, between a man and a woman, by which they engage to live together in mutual love and friendship, for the ends of procreation, *&c.* See Law, Tit. vi.

The Romans, as well as the Greeks, disallowed of polygamy. A Roman might not marry any woman who was not a Roman. It was thought dishonourable for a woman to marry twice.

We find but few laws in the books of Moses concerning the institution of marriage: he restrained the Israelites from marrying within certain degrees of consanguinity; but we find, that polygamy, though not expresly allowed, is however tacitely implied in the laws of Moses: there is a particular law that obliged a man, whose brother died without issue, to marry his widow, and raise up children to his brother. The Hebrews purchased their wives, by paying down a competent dowry for them; and a man was at liberty to marry, not only in any of the twelve tribes, but even out of them, provided it was with such nations as used circumcision.

The ancient Christian church laid several restraints upon her members in relation to marriage; such was the rule forbidding Christians to marry with infidels and heathens: another restraint related to the consanguinity and affinity prohibited in scripture: a third was, that children under age should not marry without the consent of their parents, guardians, or next relations: and another was, that there should be some parity of condition between the contracting parties. They not only condemned polygamy, but even reckoned it unlawful to marry after a divorce. The Romish church requires of the clergy perpetual abstinence from marriage; and has advanced this institution to the dignity of a sacrament.

MARROW, in anatomy, a soft oleaginous substance contained in the cavity of the bones. See Anatomy, p. 147.

MARRUBIUM, in botany, a genus of the didynamia gymnospermia class. The calix is rigid, with ten streaks; and the upper lip of the corolla is bifid, linear, and erect. There are nine species, only one of them, *viz.* the vulgare, or white horehound, is a native of Britain.

MARS, in astronomy. See Astronomy, p. 441.

Mars, among chemists, denotes iron, as being supposed to be under the influence of that planet. See Chemistry, p. 82 and 133.

MARSEILLES, a city and port of Provence, situated on a fine bay of the Mediterranean, twenty five miles north-west of Toulon: E long 5° 20′, N. lat 43° 15′.

MARSHAL, in its primary signification, means an officer who has the command or care of horses; but it is now applied to officers who have very different employments, as earl marshal, knight marshal, or marshal of the king's house, *&c.*

Marshal *of the king's bench*, an officer who has the custody of the king's-bench-prison in Southwark. This officer is obliged to give his attendance, and to take

take into his cuftody all perfons committed by that court

Marshal *of the exchequer*, an officer to whom that court commits the king's debtors.

Marshal *of the king's hall*, an officer who has the care of placing the houfehold fervants and ftrangers at table, according to their quality.

Marshal, or Mareschal, of France, an officer of the greateft dignity in the French armies. When two or more marfhals are in the army, the eldeft commands.

MARSHALLING a coat, in heraldry, is the difpofal of feveral coats of arms belonging to diftinct families, in one and the fame efcutcheon or fhield, together with their ornaments, parts, and appurtenances.

MARSHFIELD, a market-town of Wiltfhire, thirty-miles north-weft of Salifbury.

MARSHMALLOW, in botany. See Althæa.

MARSILEA, in botany, a genus of the cryptogamia clafs. The antheræ are four, and placed on an obtufely conic body: the fruit is of a roundifh figure, confifting of four cells, in each of which are contained feveral roundifh feeds. There are two fpecies, none of them natives of Britain

St MARTHA, a city and port-town of Terra Firma, in South America, and the capital of the province of St Martha: W. long. 74° 30′, N. lat 11° 45′.

MARTIAL law, is the law of war, which entirely depends on the arbitrary power of the prince, or of thofe to whom he has delegated it. For though the king can make no laws in time of peace without the confent of parliament, yet in time of war he ufes an abfolute power over the army.

MARTIN in zoology. See Mustela.

Cape Martin, a promontory of Valencia, in Spain, on the Mediterranean: it is under the meridian of London: N. lat. 38° 50′.

MARTINGALE, in the manege, a thong of leather, faftened to one end of the girths under the belly of a horfe, and at the other end to the mufs roll, to keep him from rearing.

MARTINICO, the chief of the French Caribbee-iflands, fituated in 61° of weft long. and between 14° and 15° N lat It is fixty miles long, but is fcarce twenty broad in any part

MARTLETS, in heraldry, little birds reprefented without feet, and ufed as a difference or mark of diftinction for younger brothers, to put them in mind that they are to truft to the wings of virtue and merit, in order to raife themfelves, and not their feet, they having little land to fet their foot on See Plate CX fig. 2.

MARTYNIA, in botany, a genus of the didynamia angiofpermia clafs The calix confifts of five fegments; the corolla is ringent; and the capfule is woody, with a hooked beak, two valves, and three cells. There are two fpecies, both natives of America.

MARTYR, is one who lays down his life or fuffers death for the fake of his religion.

MARTYROLOGY, is a catalogue or lift of martyrs, including the hiftory of their lives and fufferings for the fake of religion.

The martyrologies draw their materials from the kalendars of particular churches, in which the feveral feftivals dedicated to them are marked; and which feem to be derived from the practice of the ancient Romans, who inferted the names of heroes and great men in their fafti, or public regifters.

The martyrologies are very numerous, and contain many ridiculous and even contradictory narratives; which is eafily accounted for, if we confider how many forged and fpurious accounts of the lives of faints and martyrs appeared in the firft ages of the church, which the legendary writers afterwards adopted without examining into the truth of them. However, fome good critics, of late years, have gone a great way towards clearing the lives of the faints and martyrs from the monftrous heap of fiction they laboured under.

MARVEL *of Peru*, in botany See Mirabilis.

MARY MAGDALEN's day, a feftival of the Romifh church, obferved on the twenty-fecond of July.

MARYGOLD. See Caltha.

Corn Marygold. See Chrysanthemum.

French Marygold, in botany. See Tagetes.

MARYLAND, one of the Britifh plantations in North America, fituated between 74° and 78° W long. and between 38° and 40° N lat.

MASCULINE, or Masculine gender, among grammarians, that belonging to the male. See Grammar.

MASHAM, a market town of Yorkfhire, fituated twenty-four miles north weft of the city of York.

MASK See Masque.

MASON, a perfon employed, under the direction of an architect, in raifing of a ftone-building

Free and accepted Masons, a very ancient fociety or body of men, fo called, either from fome extraordinary knowledge of mafonry or building, which they are fuppofed to be mafters of, or becaufe the firft founders of the fociety were perfons of that profeffion. Thefe are now very confiderable, both for number and character, being found in every country in Europe, and confifting principally of perfons of merit and confideration. As to antiquity, they lay claim to a ftanding of fome thoufand years. What the end of their inftitution is, feems ftill in fome meafure a fecret; and they are faid to be admitted into the fraternity by being put in poffeffion of a great number of fecrets, called the mafon's word, which have been religioufly kept from age to age, being never divulged.

MASONRY, in general, a branch of architecture, confifting in the art of hewing or fquaring ftones, and cutting them level or perpendicular, for the ufes of building: but, in a more limited fenfe, mafonry is the art of affembling and joining ftones together with mortar. See Architecture.

MASS, in the church of Rome, the office or prayers ufed at the celebration of the eucharift; or, in other words, confecrating the bread and wine into the body and blood of Chrift, and offering them, fo tranfubftantiated, as an expiatory facrifice for the quick and the dead. As the mafs is in general believed to be a reprefentation of the paffion of our bleffed Saviour, fo every

every action of the prieſt, and every particular part of the ſervice, is ſuppoſed to allude to the particular circumſtances of his paſſion and death.

The general diviſion of maſſes conſiſts in high and low. The firſt is that ſung by the choriſters, and celebrated with the aſſiſtance of a deacon and ſub-deacon: low maſſes are thoſe in which the prayers are barely rehearſed without ſinging.

There are a great number of different or occaſional maſſes in the Romiſh church, many of which have nothing peculiar but the name: ſuch are the maſſes of the ſaints; that of St Mary of the ſnow, celebrated on the fifth of Auguſt; that of St Margaret, patroneſs of lying-in women; that of the feaſt of St John the Baptiſt, at which are ſaid three maſſes; that of the Innocents, at which the gloria in excelſis and the hallelujah are omitted, and it being a day of mourning the altar is of a violet colour. As to ordinary maſſes, ſome are ſaid for the dead, and, it is ſuppoſed, contribute to fetch the ſoul out of purgatory. At theſe maſſes the altar is put in mourning, and the only decorations are a croſs in the midſt of ſix yellow wax-lights: the dreſs of the celebrant and the very maſs-book are black: many parts of the office are omitted, and the people are diſmiſſed without the benediction. If the maſs be ſaid for a perſon diſtinguiſhed by his rank or virtues, it is followed with a funeral oration: they erect a chapelle ardente, that is, a repreſentation of the deceaſed, with branches and tapers of yellow wax, either in the middle of the church, or near the deceaſed's tomb, where the prieſt pronounces a ſolemn abſolution of the deceaſed. There are likewiſe private maſſes, ſaid for ſtolen or ſtrayed goods or cattle; for health; for travellers, *&c.* which go under the name of votive maſſes. There is ſtill a further diſtinction of maſſes denominated from the countries in which they were uſed; thus the Gothic maſs, or miſſa moſarabum, is that uſed among the Goths when they were maſters of Spain, and which is ſtill kept up at Toledo and Salamanca; the Ambroſian maſs is that compoſed by St Ambroſe, and uſed only at Milan, of which city he was biſhop; the Gallic maſs, uſed by the ancient Gauls; and the Roman maſs, uſed by almoſt all the churches in the Romiſh communion.

MASSA, the capital of the duchy of Maſſa Carara, in Italy, ſituated between the territories of Lucca and Genoa: E. long. 10° 40′, N. lat 43° 55′.

MASSACHUSET-COLONY, the principal ſub-diviſion of New-England, is bounded by New-Hampſhire, on the north; by the Atlantic ocean, on the eaſt and ſouth; and by Connecticut and New York, on the weſt. It is about 100 miles long, and 40 broad.

MASSALIANS, a ſet of enthuſiaſts who ſprang up about the year 361, in the reign of the emperor Conſtantius, who maintained that men have two ſouls, a celeſtial and a diabolical, and that the latter is driven out by prayer.

MASSETER, in anatomy. See ANATOMY, p. 221.

MASSORA, in matters of literature, a critical work, containing remarks on the verſes, words, letters, and vowel-points of the Hebrew text of the bible; a work more laborious than uſeful.

MAST, in naval architecture, a large timber in a ſhip, for ſuſtaining the yards, ſails, *&c.*

In large veſſels there are four maſts, *viz.* the main-maſt, fore-maſt, mizen-maſt, and bowſprit. See SHIP-BUILDING.

MASTER, in general, is a title of authority; as, the grand maſter of Malta, the maſter of St Lazarus, *&c.*

The Romans had a great many officers thus denominated; as, the maſter of the people, or dictator; the maſter of the cavalry, foot, cenſus, *&c.*

MASTER *of arts*, is the firſt degree taken up in univerſities.

MASTERS *in chancery*, in ordinary, of which there are twelve, the maſter of the rolls being chief, are uſually choſen out of the barriſters of the common law, and ſit in chancery, or at the rolls, as aſſiſtants to the lord chancellor and maſter of the rolls.

MASTER *of the horſe*, a great officer of the crown, who orders all matters relating to the king's ſtables, races, breed of horſes; and commands the equerries and all the other officers and tradeſmen employed in the king's ſtables. His coaches, horſes, and attendants are the king's, and bear the king's arms and livery.

MASTER *of the revels*, an officer who orders all things relating to the performance of plays, maſks, balls, *&c.* at court.

MASTER *of the rolls*, a patent officer for life, who has the cuſtody of the rolls of parliament and patents which paſs the great-ſeal, and of the records of chancery, as alſo commiſſions, deeds, recognizances, which, being made of rolls of parchment, gave riſe to the name.

In abſence of the chancellor, he ſits as judge in the court of chancery: at other times, he hears cauſes in the rolls chapel, and makes orders; but all hearings before him are appealable to the chancellor.

MASTER *of the wardrobe*, an officer under the lord chamberlain, who has the care of the royal robes, as well as the wearing apparel, collar, george, and garter, *&c.* He has alſo the charge of all former kings and queens robes remaining in the Tower, all hangings, bedding, *&c* for the king's houſe, the charge and delivery of velvet and ſcarlet allowed for liveries. He has under him a clerk of the robes, wardrobe-keeper, a yeoman, *&c.*

MASTER-WORT, in botany. See IMPERATORIA.

MASTICATION, the action of chewing, or of agitating the ſolid parts of our food between the teeth, by means of the motion of the jaws, the tongue, and the lips, whereby it is broken into ſmall pieces, impregnated with ſaliva, and ſo fitted for deglutition and a more eaſy digeſtion.

MASTICH, in the materia medica, a ſolid reſin, of a pale, yellow, white colour, brought to us principally from the iſland of Chios, in drops or tears as it naturally forms itſelf in exſudating from the tree, about the bigneſs and much in the form of a pea. It is to be choſen clear, pellucid, and of a pale yellowiſh colour, well ſcented, and brittle. We meet with a kind of cæment ſometimes kept in the ſhops under the name of maſtich. It is compoſed of maſtich, and ſeveral other ingredients, and is formed into cakes for uſe. This is intended for the ſervice of the lapidaries, to fill up cracks in ſtones, and for other ſuch purpoſes: but

but is by no means to be uſed as maſtich for any of the medicinal purpoſes.

Maſtich is detergent, aſtringent, and ſtomachic; it is greatly recommended in inveterate coughs and againſt ſpitting of blood. It ſtrengthens the ſtomach, aſſiſts digeſtion, and ſtops vomiting.

MASTIGADOUR, or SLABBERING-BIT, in the manege, a ſnaffle of iron, all ſmooth, and of a piece, guarded with paternoſters, and compoſed of three halfs of great rings, made into demi-ovals, of unequal bigneſs; the leſſer being incloſed within the greater, which ought to be about half a foot high.

MASULIPATAN, a city and port town of the hither India: E. long. 81°, and N. lat. 16° 18′.

MATAMAN, a country in the ſouth-weſt of Africa, bounded by Benguelo, on the north; by Manomotapa, on the eaſt; by Caffraria, on the ſouth; and by the Atlantic ocean, on the weſt.

MATAPAN CAPE, in the Morea, the ſouthmoſt promontory of Europe, ſituated in E. long. 22°, N. lat. 36°.

MATCH, a kind of rope ſlightly twiſted, and prepared to retain fire for the uſes of artillery, mines, fireworks, *&c.*

It is made of hempen tow, ſpun on the wheel like cord, but very ſlack; and is compoſed of three twiſts, which are afterwards again covered with tow, ſo that the twiſts do not appear: laſtly, it is boiled in the lees of old wines. This, when once lighted at the end, burns on gradually and regularly, without ever going out, till the whole be conſumed: the hardeſt and drieſt match is generally the beſt.

MATCHING, in the wine trade, the preparing veſſels to preſerve wines and other liquors, without their growing ſour or vapid. The method of doing it, is as follows: melt brimſtone in an iron ladle, and when thoroughly melted, dip into it ſlips of coarſe linen-cloth; take theſe out, and let them cool: this the wine coopers call a match; take one of theſe matches, ſet one end of it on fire, and put it into the bung-hole of a caſk; ſtop it looſely, and thus ſuffer the match to burn nearly out: then drive in the bung tight, and ſet the caſk aſide for an hour or two. At the end of this time examine the caſk, and you will find that the ſulphur has communicated a violent pungent and ſuffocating ſcent to the caſk, with a conſiderable degree of acidity, which is the gas and acid ſpirit of the ſulphur. The caſk may after this be filled with a ſmall wine, which has ſcarce done its fermentation; and bunging it down tight, it will be kept good, and will ſoon clarify: this is a common and very uſeful method; for many poor wines could ſcarce be kept potable even a few months without it.

Dura MATER. See ANATOMY, p. 284.

Pia MATER. See ANATOMY, p. 285.

MATERAN, the capital of a kingdom of the ſame name, ſituated on the ſouth coaſt of the iſland of Java. This city is ſaid to lie in E. long. 110°, S. lat. 7° 45′.

MATERIA SUBTILIS, denotes a fine ſubtile matter, which the Carteſians ſuppoſe to pervade and penetrate freely the pores of all bodies, to fill up all their pores ſo as not to leave the leaſt vacuity or interſtice between them: they had recourſe to this machine to ſupport the doctrine of an abſolute plenum, and to make it conſiſtent with the phænomenon of motion, *&c.*

MATERIA MEDICA, comprehends all the ſubſtances either uſed in medicine in their natural ſtate, or which afford preparations that are ſo; theſe belong partly to the animal, partly to the vegetable, and partly to the foſſil kingdom.

The preparations and virtues of all which are delivered under their reſpective articles, but in as conciſe and ſcrupulous a manner as we poſſibly could; ſince we cannot but remark, that it is too frequent in writers on the materia medica, to give us rather encomiums than impartial accounts of the ſimples they treat of.

MATHEMATICS, originally ſignified any diſcipline or learning; but, at preſent, denotes that ſcience which teaches, or contemplates, whatever is capable of being numbered or meaſured, in ſo far as computable or meaſurable; and accordingly is ſubdivided into Arithmetic, which has numbers for its object, and Geometry, which treats of magnitude. See ARITHMETICK and GEOMETRY.

Mathematics are commonly diſtinguiſhed into pure and ſpeculative, which conſider quantity abſtractedly; and mixed, which treat of magnitude as ſubſiſting in material bodies, and conſequently are interwoven every where with phyſical conſiderations.

Mixed mathematics are very comprehenſive; ſince to them may be referred Aſtronomy, Optics, Geography, Hydroſtatics, Mechanics, Fortification, Navigation, *&c.* See the articles ASTRONOMY, OPTICS, *&c.*

Pure mathematics have one peculiar advantage, that they occaſion no diſputes among wrangling diſputants, as in other branches of knowledge; and the reaſon is, becauſe the definitions of the terms are premiſed, and every body that reads a propoſition has the ſame idea of every part of it. Hence it is eaſy to put an end to all mathematical controverſies, by ſhewing, either that our adverſary has not ſtuck to his definitions, or has not laid down true premiſſes, or elſe that he has drawn falſe concluſions from true principles; and in caſe we are able to do neither of theſe, we muſt acknowledge the truth of what he has proved.

It is true, that in mixed mathematics, where we reaſon mathematically upon phyſical ſubjects, we cannot give ſuch juſt definitions as the geometricians: we muſt therefore reſt content with deſcriptions, and they will be of the ſame uſe as definitions, provided we are conſiſtent with ourſelves, and always mean the ſame thing by thoſe terms we have once explained.

Dr. Barrow gives a moſt elegant deſcription of the excellence and uſefulneſs of mathematical knowledge, in his inaugural oration, upon being appointed profeſſor of mathematics at Cambridge.

The mathematics, he obſerves, effectually exerciſe, not vainly delude, nor vexatiouſly torment, ſtudious minds with obſcure ſubtilties; but plainly demonſtrate every thing within their reach, draw certain concluſions, inſtruct by profitable rules, and unfold pleaſant queſtions. Theſe diſciplines likewiſe enure and corroborate the mind to a conſtant diligence in ſtudy; they wholly deliver us from a credulous ſimplicity, moſt ſtrongly fortify us againſt the vanity of ſcepticiſm, effectual

fectually restrain us from a rash presumption, most easily incline us to a due assent, perfectly subject us to the government of right reason. While the mind is abstracted and elevated from sensible matter, distinctly views pure forms, conceives the beauty of ideas, and investigates the harmony of proportions; the manners themselves are sensibly corrected and improved, the affections composed and rectified, the fancy calmed and settled, and the understanding raised and excited to more divine contemplations.

MATRASS, Cucurbit, or Bolt-head, among chemists. See Chemistry, p. 109.

MATRICARIA, in botany, a genus of the syngenesia polygamia superflua class. The receptacle is naked; it has, no pappus; the calix is hemispherical, and imbricated, with sharp solid margins. There are five species, all of them natives of Britain, *viz.* The parthonium, or feverfew, which is reckoned good in hysteric cases; the chamomilla, or corn-feverfew, the flowers of which are stomachic; the suaveolens, or sweet-scented feverfew; the inodora, or field feverfew; and the maritima, or sea feverfew.

MATRICULA, a register kept of the admission of officers and persons entered into any body or society, whereof a list is made.

MATRIX, in anatomy. See Anatomy, p. 274.

MATRONALIA, a festival of the ancient Roman matrons, from whom it had its name. It was celebrated on the kalends of March in honour of the god Mars: and was to the Roman ladies what the festival of the Saturnalia was to their husbands; for at this time they served their women slaves at tables, and received presents from their husbands. See Saturnalia.

MATROSSES, are soldiers in the train of artillery, who are next to the gunners, and assist them in loading, firing, and spunging the great guns. They carry firelocks, and march along with the store-waggons, both as a guard, and to give their assistance in case a waggon should break down.

MATT, in a ship's rope-yard, junk, *&c.* beat flat and interwoven; used in order to preserve the yards from galling or rubbing in hoisting or lowering them.

MATTER, whatever is extended and capable of making resistance: hence, because all bodies, whether solid or fluid, are extended, and do resist, we conclude that they are material, or made up of matter. See Mechanics.

MATTHEW, or *Gospel of St.* Matthew, a canonical book of the New Testament.

St. Matthew wrote his gospel in Judea, at the request of those he had converted; and it is thought he began it in the year 41, eight years after Christ's resurrection. It was written, according to the testimony of all the ancients, in the Hebrew or Syriac language, which was then common in Judea; but the Greek version of it, which now passes for the original, it as old as the apostolical times.

St. Matthew *the Evangelist's day*, a festival of the Christian church, observed on September 21.

St. Matthew, in geography, a small island on the coast of Guinea, planted by the Portuguese, but deserted: W. long. 9°, S. lat. 2° 30′.

St. MATTHIAS's *day*, a festival of the Christian church, observed on the 24th of February.

MATTINS, the first canonical hour, or the first part of the daily service, in the Romish church.

MATTURANTS, in pharmacy, medicines which promote the suppuration of tumours.

MAUNCH, in heraldry, the figure of an ancient coat-sleeve, borne in many gentlemens escutcheons.

MAUNDY Thursday, is the Thursday in Passion-week, which was called Maunday or Mandate-thursday, from the command which our Saviour gave his apostles to commemorate him in the Lord's supper, which he this day instituted; or from the new commandment which he gave them to love one another, after he had washed their feet as a token of his love to them.

St. MAURA, an island of the Mediterranean, situated between the province of Epirus, and the island of Cephalonia; subject to Venice: E. long. 21°, N. lat. 38° 50′.

MAURICE, or Moritius, an island in the Indian ocean, subject to the Dutch: E. long. 55°, S. lat. 20°.

MAURIENNE, St John, the capital of the territory of Maurienne, in Savoy: E. long. 6° 10′, N. lat. 45° 18′.

MAURITANIA, the ancient name of the coast of Barbary, from the city of Tangier to that of Algiers: the west part of it, in which Tangier stands, was called Mauritania Tingitana; and that farther east, Mauritania Cæsariensis.

MAUSOLEUM, a magnificent tomb, or funeral monument. The word is derived from Mausolus, king of Caria, to whom Artemisia, his widow, erected a most stately monument, esteemed one of the wonders of the world, and called it, from his name, Mausoleum.

St. MAWES, a port and borough town of Cornwall: situated twenty miles north of the Lizard. It sends two members to parliament.

MAXILLA, the jaws, or those parts of an animal in which the teeth are set.

MAXIM, an established proposition or principle; in which sense it denotes much the same with axiom.

MAXIMUM, in mathematics, denotes the greatest quantity attainable in any given case.

If a quantity conceived to be generated by motion, increases, or decreases, till it arrives at a certain magnitude or position, and then on the contrary grows lesser or greater, and it be required to determine the said magnitude or position, the question is called a problem de maximis et minimis.

MAY, the fifth month of the year, consisting of thirty-one days.

May, is also the name of a little island, in the mouth of the frith of Forth, in Scotland.

MAYENNE, a city of France, in the province of Orleanois: W. long. 45′, and N. lat. 48° 20′.

MAYO, one of the Cape Verde islands: W. long. 23°, N. lat. 15°.

Mayo, is also a county of Ireland, in the province of Connaught, having Slego on the north, and Roscommon on the south.

MAYOR,

MAYOR, the chief magiſtrate of a city or town, choſen annually out of the aldermen.

MAZARA, the capital of the province of the ſame name in Sicily, ſituated on the ſouth-weſt coaſt: E. long. 12° 30′, N. lat. 37° 42′.

MEAD, an agreeable liquor, made of honey and water.

There are many receipts for making mead, of which the following is one of the beſt. Take four gallons of water, and as much honey as will make it bear an egg; add to this, the rind of three lemons; boil it, and ſcum it well as it riſes. Then take it off the fire, and add the three lemons cut in pieces; pour it into a clean tub or open veſſel, and let it work for three days: then ſcum it well, and pour off the clear part into a caſk, and let it ſtand open till it ceaſes to make a hiſſing noiſe; then ſtop it up cloſe, and in three months time it will be fine and fit for bottling.

If you would give it a finer flavour, take cloves, mace, and nutmeg, of each four drams; beat them ſmall, tie the powder in a piece of cloth, and put it into the caſk.

MEADOW, in its general ſignification, means paſture or graſs-land, annually mown for hay; but it is more particularly applied to lands that are ſo low as to be too moiſt for cattle to graze upon them in winter without ſpoiling the ſward.

MEAN, in general, denotes the middle between two extremes: thus we ſay, mean diſtance, mean proportion, *&c.*

MEASLES, in medicine, a cutaneous diſeaſe, attended with a fever, in which there is an appearance of eruptions that do not tend to a ſuppuration. See MEDICINE.

MEASURE, in geometry, denotes any quantity aſſumed as one, or unity, to which the ratio of other homogeneous or ſimilar quantities is expreſſed.

MEASURE, in a legal and commercial ſenſe, denotes a certain quantity or proportion of any thing bought, ſold, valued, or the like. Meaſures are then various, according to the various kinds and dimenſions of the things meaſured. Hence ariſe lineal or longitudinal meaſures, for lines or lengths; ſquare meaſures, for areas or ſuperficies; and ſolid or cubic meaſures, for bodies and their capacities. All which again are very different in different countries, and in different ages, and even many of them for different commodities. Whence ariſe other diviſions of ancient and modern meaſures, domeſtic and foreign ones, dry meaſures, liquid meaſures, *&c.* For the different kinds of meaſures, ſee ARITHMETIC, GEOMETRY, and the particular names of meaſures, as they occur in the alphabetical order.

MEASURE is alſo uſed to ſignify the cadence and time obſerved in poetry, dancing, and muſic, to render them regular and agreeable.

MEASURE, in muſic, the interval or ſpace of time which the perſon who beats time takes between the riſing and falling of his hand, in order to conduct the movement ſometimes quicker and ſometimes ſlower, according to the muſic or ſubject that is to be ſung or played.

MEAT. See FOOD, DIET, DRINK, *&c.*

MEATH, the name of two counties in Ireland, in the province of Leinſter, diſtinguiſhed by the epithets Eaſt and Weſt.

MEATUS AUDITORIUS, in anatomy. See ANATOMY, p. 296.

MEAUX, a city in France, twenty-four miles north-eaſt of Paris.

MECCA, the capital of Arabia, and place of Mohammed's nativity: E. long. 43° 30′, N. lat. 21° 20′.

It is a large well-built city, in the middle of which ſtands the caaba, or temple.

M E C H A N I C S.

THIS term, in the common acceptation, implies no more than the nature of what is called the mechanical powers, together with the combination of theſe powers in the conſtruction of machines. But as the general properties of matter and central forces are neceſſary in order to a thorough knowledge of mechanics, we have joined all theſe ſubjects together under the general name of *Mechanics*.

Of MATTER, *and its Properties.*

BY the word *matter* is here meant every thing that has length, breadth, and thickneſs, and reſiſts the touch.

The inherent properties of matter are ſolidity, inactivity, mobility, and diviſibility.

The *ſolidity* of matter ariſes from its having length, breadth, thickneſs; and hence it is that all bodies are comprehended under ſome ſhape or other, and that every particular body hinders all others from occupying the ſame part of ſpace which it poſſeſſeth. Thus, if a piece of wood or metal be ſqueezed ever ſo hard between two plates, they cannot be brought into contact. And even water or air has this property; for if a ſmall quantity of it be fixed between any other bodies, they cannot be brought to touch one another.

A ſecond property of matter is *inactivity*, or *paſſiveneſs*; by which it always endeavours to continue in the ſtate that it is in, whether of reſt or motion. And therefore, if one body contains twice or thrice as much matter as another body does, it will have twice or thrice as much inactivity; that is, it will require twice or thrice as much force to give it an equal degree of motion, or to ſtop it after it hath been put into ſuch a motion.

That matter can never put itſelf into a motion is allowed by all men. For a ſtone, lying on the plain ſurface of the earth, never removes itſelf from that place, nor does any one imagine it ever can. But moſt people are apt to believe, that all matter has a propenſity to fall from a ſtate of motion into a ſtate of reſt; becauſe they ſee, that if a ſtone

ſtone or a cannon-ball be put into ever ſo violent a motion, it ſoon ſtops; not conſidering that this ſtoppage is cauſed, 1. By the gravity or weight of the body, which ſinks it to the ground in ſpite of the impulſe; and, 2. By the reſiſtance of the air through which it moves, and by which its velocity is retarded every moment till it falls.

A bowl moves but a ſhort way upon a bowling-green; becauſe the roughneſs and unevenneſs of the graſſy ſurface ſoon creates friction enough to ſtop it. But if the green were perfectly level, and ſmooth, and the bowl were perfectly hard, round, and ſmooth, it would go a great way further; as it would have nothing but the air to reſiſt it: if then the air were taken away, the bowl would go on without any friction, and conſequently without any diminution of the velocity it had at ſetting out: and therefore, if the green were extended quite around the earth, the bowl would go on round and round the earth, for ever.

If the bowl were carried ſeveral miles above the earth, and there projected in a horizontal direction, with ſuch a velocity as would make it move more than a ſemidiameter of the earth, in the time it would take to fall to the earth by gravity: in that caſe, and if there were no reſiſting medium in the way, the bowl would not fall to the earth at all; but would continue to circulate round it, keeping always in the ſame tract, and returning to the ſame point from which it was projected, with the ſame velocity as at firſt. In this manner the moon moves round the earth, although ſhe be as unactive and dead as any ſtone upon it.

The third property of matter is *mobility;* for we find that all matter is capable of being moved, if a ſufficient degree of force be applied to overcome its inactivity or reſiſtance.

The fourth property of matter is *diviſibility*, of which there can be no end. For ſince matters can never be annihilated by cutting or breaking, we can never imagine it to be cut into ſuch ſmall particles, but that if one of them be laid on a table, the uppermoſt ſide of it will be further from the table than the undermoſt ſide.

Plate CV. fig. 1. That matter is infinitely diviſible in a mathematical ſenſe, is eaſy to be demonſtrated. For, let AB be the length of a particle to be divided; and let it be touched at oppoſite ends by the parallel lines CD and EF, which ſuppoſe to be infinitely extended beyond D and F. Set off the equal diviſions BG, GH, HI. *&c.* on the line EF, towards the right hand from B; and take a point, as at R, any where towards the left hand from A, in the line CD: Then, from this point draw the right lines RG, RH, RI, *&c.* each of which will cut off a part from the particle AB. But after any finite number of ſuch lines are drawn, there will ſtill remain a part, as AP, at the top of the particle, which can never be cut off: becauſe the lines DR and EF being parallel, no line can ever be drawn from the point R to any point of the line EF that will coincide with the line RD. Therefore the particle AB contains more than any finite number of parts.

A fifth property of matter is *attraction*, which ſeems rather to be infuſed than inherent. Of this there are four kinds, viz. *cohesion*, *gravitation*, *magnetiſm*, and *electricity*.

The *attraction of coheſion* is that by which the ſmall parts of matter are made to ſtick and cohere together. Of this we have ſeveral inſtances, ſome of which follow.

1. If a ſmall glaſs tube, open at both ends, be dipt in water, the water will riſe up in the tube to a conſiderable height above its level in the baſon: which muſt be owing to the attraction of a ring of particles of the glaſs all around in the tube, immediately above thoſe to which the water at any inſtant riſes. And when it has riſen ſo high, that the weight of the column balances the attraction of the tube, it riſes no higher. This can be no ways owing to the preſſure of the air upon the water in the baſon; for, as the tube is open at top, it is full of air above the water, which will preſs as much upon the water in the tube as the neighbouring air does upon any column of an equal diameter in the baſon. Beſides, if the ſame experiment be made in an exhauſted receiver of the air-pump, there will be found no difference.

2. A piece of loaf-ſugar will draw up a fluid, and a ſpunge will ſuck in water; and on the ſame principle ſap aſcends in trees.

3. If two drops of quickſilver be placed near each other, they will run together, and become one large drop.

4. If two pieces of lead be ſcraped clean, and preſſed together with a twiſt, they will attract each other ſo ſtrongly, as to require a force much greater than their own weight to ſeparate them. And this cannot be owing to the preſſure of the air, for the ſame thing will hold in an exhauſted receiver.

5. If two poliſhed plates of marble or braſs be put together, with a litle oil between them to fill up the pores in their ſurfaces, and prevent the lodgement of any air; they will cohere ſo ſtrongly, even if ſuſpended in an exhauſted receiver, that the weight of the lower plate will not be able to ſeparate it from the upper one. In putting theſe plates together, the one ſhould be rubbed upon the other, as a joiner does two pieces of wood when he glues them.

6. If two pieces of cork, equal in weight, be put near each other in a baſon of water, they will move equally faſt toward each other, with an accelerated motion, until they meet: and then, if either of them be moved, it will draw the other after it. If two corks of unequal weights be placed near each other, they will approach with accelerated velocities inverſely proportionate to their weights: that is, the lighter cork will move as much faſter than the heavier, as the heavier exceeds the lighter in weight. This ſhews that the attraction of each cork is in direct proportion to its weight or quantity of matter.

This kind of attraction reaches but to a very ſmall diſtance; for, if two drops of quickſilver be rolled in duſt, they will not run together, becauſe the particles of duſt keeps them out of the ſphere of each other's attraction.

Where the ſphere of attraction ends, a *repulſive force* begins; thus, water repels moſt bodies till they are wet; and hence it is, that a ſmall needle, if dry, ſwims upon water; and flies walk upon it without wetting their feet.

The repelling force of the particles of a fluid is but ſmall; and therefore, if a fluid be divided, it eaſily unites again. But if glaſs, or any other hard ſubſtance, be broke

broke into ſmall parts, they cannot be made to ſtick together again without being firſt wetted: the repulſion being too great to admit of a re-union.

The repelling force between water and oil is ſo great, that we find it almoſt impoſſible to mix them ſo as not to ſeparate again. If a ball of light wood be dipt in oil, and then put into water, the water will recede ſo as to form a channel of ſome depth all around the ball.

The repulſive force of the particles of air is ſo great, that they can never be brought ſo near together by condenſation as to make them ſtick or cohere. Hence it is, that when the weight of the incumbent atmoſphere is taken off from any ſmall quantity of air, that quantity will diffuſe itſelf ſo as to occupy (in compariſon) an infinitely greater portion of ſpace than it did before.

Attraction of gravitation is that power by which diſtant bodies tend towards one another. Of this we have daily inſtances in the falling of bodies to the earth. By this power in the earth it is, that bodies, on whatever ſide, fall in lines perpendicular to its ſurface; and conſequently, on oppoſite ſides, they fall in oppoſite directions; all towards the centre, where the force of gravity is as it were accumulated; and by this power it is, that bodies on the earth's ſurface are kept to it on all ſides, ſo that they cannot fall from it. And as it acts upon all bodies in proportion to their reſpective quantities of matter, without any regard to their bulks or figures, it accordingly conſtitutes their weight. Hence,

If two bodies which contain equal quantities of matter, were placed at ever ſo great a diſtance from one another, and then left at liberty in free ſpace; if there were no other bodies in the univerſe to affect them, they would fall equally ſwift towards one another by the power of gravity, with velocities accelerated as they approached each other; and would meet in a point which was half way between them at firſt. Or, if two bodies containing unequal quantities of matter, were placed at any diſtance, and left in the ſame manner at liberty, they would fall towards one another with velocities which would be in an inverſe proportion to their reſpective quantities of matter; and moving faſter and faſter in their mutual approach, would at laſt meet in a point as much nearer to the place from which the heavier body began to fall, than to the place from which the lighter body began to fall, as the quantity of matter in the former exceeded that in the latter.

All bodies that we know of have gravity or weight. For, that there is no ſuch thing as poſitive levity, even in ſmoke, vapours, and fumes, is demonſtrable by experiments on the air-pump: which ſhews, that although the ſmoke of a candle aſcends to the top of a tall receiver, when full of air; yet upon the air's being exhauſted out of the receiver, the ſmoke falls down to the bottom of it. So, if a piece of wood be immerſed in a jar of water, the wood will riſe to the top of the water, becauſe it has a leſs degree of weight than its bulk of water has; but if the jar be emptied of water, the wood falls to the bottom.

As every particle of matter has its proper gravity, the effect of the whole muſt be in proportion to the number of the attracting particles; that is, as the quantity of matter in the whole body. This is demonſtrable by experiments on pendulums; for if they are of equal lengths, whatever their weights be, they vibrate in equal times. Now it is plain, that if one be double or triple the weight of another, it muſt require a double or triple power of gravity to make it move with the ſame celerity; juſt as it would require a double or triple force to project a bullet of twenty or thirty pound weight with the ſame degree of ſwiftneſs that a bullet of ten pounds would require. Hence, it is evident, that the power or force of gravity is always proportional to the quantity of matter in bodies, whatever their bulks or figures are.

Gravity alſo, like all other virtues or emanations which proceed or iſſue from a centre, decreaſes as the diſtance multiplied by itſelf increaſes: that is, a body at twice the diſtance of another attracts with only a fourth part of the force; at thrice the diſtance, with a ninth part; at four times the diſtance, with a ſixteenth part; and ſo on. This too is confirmed by comparing the diſtance which the moon falls in a minute from a right line touching her orbit, with the diſtance through which heavy bodies near the earth fall in that time; and alſo by comparing the forces which retain Jupiter's moons in their orbits, with their reſpective diſtances from Jupiter. Theſe forces will be explained afterwards.

The velocity which bodies near the earth acquire in deſcending freely by the force of gravity, is proportional to the times of their deſcent. For, as the power of gravity does not conſiſt in a ſingle impulſe, but is always operating in a conſtant and uniform manner, it muſt produce equal effects in equal times; and conſequently in a double or triple time, a double or triple effect; and ſo, by acting uniformly on the body, muſt accelerate its motion proportionably to the time of its deſcent.

To be a little more particular on this ſubject, let us ſuppoſe that a body begins to move with a celerity conſtantly and gradually increaſing, in ſuch a manner, as would carry it through a mile in a minute; at the end of this ſpace it will have acquired ſuch a degree of celerity, as is ſufficient to carry it two miles the next minute, tho' it ſhould then receive no new impulſe from the cauſe by which its motion had been accelerated: but if the ſame accelerating cauſe continues, it will carry the body a mile farther; on which account, it will have run through four miles at the end of two minutes; and then it will have acquired ſuch a degree of celerity, as is ſufficient to carry it through a double ſpace in as much more time, or eight miles in two minutes, even though the accelerating force ſhould act upon it no more. But this force ſtill continuing to operate in an uniform manner, will again, in an equal time, produce an equal effect; and ſo, by carrying it a mile further, cauſe it to move through five miles the third minute; for, the celerity already acquired, and the celerity ſtill acquiring, will each have its complete effect. Hence we learn, that if the body ſhould move one mile the firſt minute, it would move three the ſecond, five the third, ſeven the fourth, nine the fifth, and ſo on in proportion.

And thus it appears, that the ſpaces deſcribed in ſucceſſive equal parts of time, by an uniformly accelerated motion, are always as the odd numbers 1, 3, 5, 7, 9, *&c.*

&c. and consequently, the whole spaces are as the squares of the times, or of the last acquired velocities. For, the continued addition of the odd numbers yields the squares of all numbers from unity upwards. Thus, 1, is the first odd number, and the square of 1 is 1; 3 is the second odd number, and this added to 1 makes 4, the square of 2; 5 is the third odd number, which added to 4 makes 9, the square of 3; and so on for ever. Since, therefore, the times and velocities proceed evenly and constantly as 1, 2, 3, 4, *&c.* but the spaces described in each equal time are as 1, 3, 5, 7, *&c.* it is evident that the space described,

In 1 minute will be - - $1 =$ square of 1
In 2 minutes - - $1+3= 4 =$ square of 2
In 3 minutes - $1+3+5= 9 =$ square of 3
In 4 minutes $1+3+5+7=16 =$ square of 4 &c.

As heavy bodies are uniformly accelerated by the power of gravity in their descent, it is plain that they must be uniformly retarded by the same power in their ascent. Therefore, the velocity which a body acquires by falling, is sufficient to carry it up again to the same height from whence it fell; allowance being made for the resistance of the air, or other medium in which the body is moved. Thus, the body D (fig. 2.) in rolling down the inclined plane AB, will acquire such a velocity by the time it arrives at B, as will carry it up to the inclined plane BC, almost to C; and would carry it quite up to C, if the body and plane were perfectly smooth, and the air gave no resistance.—So, if a pendulum were put into motion in a space quite void of air and all other resistance, and had no friction on the point of suspension, it would move for ever; for the velocity it had acquired in falling through the descending part of the arc, would be still sufficient to carry it equally high in the ascending part thereof.

The *centre of gravity* is that point of a body in which the whole force of its gravity or weight is united. Therefore, whatever supports that point bears the weight of the whole body; and whilst it is supported, the body cannot fall, because all its parts are in a perfect equilibrium about that point.

An imaginary line drawn from the centre of gravity of any body towards the centre of the earth, is called the *line of direction*. In this line all heavy bodies descend, if not obstructed.

Since the whole weight of a body is united in its centre of gravity, as that centre ascends or descends we must look upon the whole body to do so too. But as it is contrary to the nature of heavy bodies to ascend of their own accord, or not to descend when they are permitted; we may be sure that, unless the centre of gravity be supported, the whole body will tumble or fall. Hence it is, that bodies stand upon their bases when the line of direction falls within the base; for in this case the body cannot be made to fall without first raising the centre of gravity higher than it was before. Thus, the inclining body ABCD, (fig 3.) whose centre of gravity is E, stands firmly on its base CDIK, because the line of direction EF falls within the base. But if a weight, as ABGH, be laid upon the top of the body, the centre of gravity of the whole body and weight together is raised up to I; and and then, as the line of direction ID falls without the base at D, the centre of gravity I is not supported; and the whole body and weight tumble down together.

The broader the base is, and the nearer the line of direction is to the middle or centre of it, the more firmly does the body stand. On the contrary, the narrower the base, and the nearer the line of direction is to the side of it, the more easily may the body be overthrown: a less change of position being sufficient to remove the line of direction out of the base in the latter case than in the former. And hence it is, that a sphere is so easily rolled upon a horizontal plane; and that it is so difficult, if not impossible, to make things which are sharp pointed to stand upright on the point.—From what hath been said, it plainly appears, that if the plane be inclined on which the heavy body is placed, the body will slide down upon the plane whilst the line of direction falls within the base; but it will tumble or roll down when that line falls without the base. Thus, the body A (fig. 4.) will only slide down the inclined plane CD, whilst the body B rolls down upon it.

When the line of direction falls within the base of our feet, we stand; and most firmly, when it is in the middle: but when it is out of that base, we immediately fall. And it is not only pleasing, but even surprising, to reflect upon the various and unthought of methods and postures which we use, to retain this position, or to recover it when it is lost. For this purpose, we bend our body forward when we rise from a chair, or when we go up stairs: and for this purpose a man leans forward when he carries a burden on his back, and backward when he carries it on his breast, and to the right or left side as he carries it on the opposite side.

The quantity of matter in all bodies is in exact proportion to their weights, bulk for bulk. Therefore, heavy bodies are as much more dense or compact than light bodies of the same bulk, as they exceed them in weight.

All bodies are full of pores, or spaces void of matter: and in gold, which is the heaviest of all known bodies, there is perhaps a greater quantity of space than of matter. For the particles of heat and magnetism find an easy passage through the pores of gold; and even water itself has been forced through them. Besides, if we consider how easily the rays of light pass through so solid a body as glass, in all manner of directions, we shall find reason to believe that bodies are exceedingly porous.

All bodies are some way or other affected by heat; and all metallic bodies are expanded in length, breadth, and thickness thereby.—The proportion of the expansion of several metals, according to the best experiments, is nearly thus. Iron and glass as 3, steel 4, copper 4 and one eighth, brass 5, tin 6, lead 6 and one eighth. An iron rod 3 feet long is about one 70th part of an inch longer in summer than in winter.

The expansion of metals by heat, is demonstrated by the following machine, called a pyrometer AA (fig. 5.) is a flat piece of mahogony, in which are fixed four brass studs B,C,D,L; and two pins, one at F, and the other at H. On the pin F turns the crooked index EI, and upon the pin H the straight index GK; against which a piece of watch-spring R bears gently, and so presses it towards

towards the beginning of the ſcale MN, over which the point of that index moves. This ſcale is divided into inches and tenth parts of an inch: the firſt inch is marked 1000, the ſecond 2000, and ſo on. A bar of metal O is laid into notches in the top of the ſtuds C and D; one end of the bar bearing againſt the adjuſting ſcrew P, and the other end againſt the crooked index EI, at a 20th part of its length from its centre of motion F.—Now it is plain, that however much the bar O lengthens, it will move that part of the index EI againſt which it bears juſt as far: but the crooked end of the ſame index, near H, being 20 times as far from the centre of motion F as the point is againſt which the bar bears, it will move 20 times as far as the bar lengthens. And as this crooked end bears againſt the index GK at only a 20th part of its whole length GS from its centre of motion H, the point S will move through 20 times the ſpace that the point of bearing near H does. Hence, as 20 multiplied by 20 produces 400, it is evident, that if the bar lengthens but a 400th part of an inch, the point S will move a whole inch on the ſcale; and as every inch is divided into 10 equal parts, if the bar lengthens but the 10th part of the 400th part of an inch, which is only the 4000th part of an inch, the point S will move the tenth part of an inch, which is very perceptible.

To find how much a bar lengthens by heat, firſt lay it cold into the notches of the ſtuds, and turn the adjuſting ſcrew P until the ſpring R brings the point S of the index GK to the beginning of the diviſions of the ſcale at M: then, without altering the ſcrew any farther, take off the bar, and rub it with a dry woollen cloth till it feels warm: and then, laying it on where it was, obſerve how far it puſhes the point S upon the ſcale by means of the crooked index EI; and the point S will ſhew exactly how much the bar has lengthened by the heat of rubbing. As the bar cools, the ſpring R bearing againſt the index KG, will cauſe its point S to move gradually back towards M in the ſcale: and when the bar is quite cold, the index will reſt at M, where it was before the bar was made warm by rubbing. The indexes have ſmall rollers under them at I and K; which, by turning round on the ſmooth wood as the indexes move, make their motions the eaſier, by taking off a great part of the friction, which would otherwiſe be on the pins F and H, and of the points of the indexes themſelves on the wood.

Beſides the univerſal properties above mentioned, there are bodies which have properties peculiar to themſelves: ſuch as the loadſtone, in which the moſt remarkable are theſe, 1. It attracts iron and ſteel only. 2. It conſtantly turns one of its ſides to the north and another to the ſouth, when ſuſpended by a thread that does not twiſt. 3. It communicates all its properties to a piece of ſteel when rubbed upon it, without loſing any itſelf.

According to Dr Helſham's experiments, the attraction of the loadſtone decreaſes as the ſquare of the diſtance increaſes. Thus, if a loadſtone be ſuſpended at one end of a balance, and counterpoiſed by weights at the other end, and a flat piece of iron be placed beneath it, at the diſtance of four tenths of an inch, the ſtone will immediately deſcend and adhere to the iron. But if the ſtone be again removed to the ſame diſtance, and as many grains be put into the ſcale at the other end as will exactly counterbalance the attraction, then, if the iron be brought twice as near the ſtone as before, that is, only two tenth-parts of an inch from it, there muſt be four times as many grains put into the ſcale as before, in order to be a juſt counterbalance to the attractive force, or to hinder the ſtone from deſcending and adhering to the iron. So if four grains will do in the former caſe, there muſt be ſixteen in the latter. But from ſome later experiments, made with the greateſt accuracy, it is found that the force of magnetiſm decreaſes in a ratio between the reciprocal of the ſquare and the reciprocal of the cube of the diſtance; approaching to the one or the other, as the magnitudes of the attracting bodies are varied

Several bodies, particularly amber, glaſs, jet, ſealing-wax, agate, and almoſt all precious ſtones, have a peculiar property of attracting and repelling light bodies when heated by rubbing. This is called *electrical attraction*; for the properties of which, ſee ELECTRICITY.

Of Central Forces.

WE have already mentioned it as a neceſſary conſequence ariſing from the deadneſs or inactivity of matter, that all bodies endeavour to continue in the ſtate they are in, whether of reſt or motion. If the body A (fig. 6.) were placed in any part of free ſpace, where nothing either draws or impels it any way, it would for ever remain in that part of ſpace, becauſe it could have no tendency of itſelf to remove any way from thence. If it receives a ſingle impulſe any way, as ſuppoſe from A towards B, it will go on in that direction; for, of itſelf it could never ſwerve from a right line, nor ſtop its courſe.—When it has gone through the ſpace AB, and met with no reſiſtance, its velocity will be the ſame at B as it was at A; and this velocity, in as much more time, will carry it through as much more ſpace, from B to C; and ſo on for ever. Therefore, when we ſee a body in motion; we conclude that ſome other ſubſtance muſt have given it that motion; and when we ſee a body fall from motion to reſt, we conclude that ſome other body or cauſe ſtopt it.

As all motion is naturally rectilineal, it appears, that a bullet projected by the hand, or ſhot from a cannon, would for ever continue to move in the ſame direction it received at firſt, if no other power diverted its courſe. Therefore, when we ſee a body move in a curve of any kind whatever, we conclude it muſt be acted upon by two powers at leaſt; one putting it in motion, and another drawing it off from the rectilineal courſe it would otherwiſe have continued to move in: and whenever that power, which bent the motion of the body from a ſtraight line into a curve, ceaſes to act, the body will again move on in a ſtraight line, touching that point of the curve in which it was when the action of that power ceaſed. For example, a pebble moved round in a ſling ever ſo long a time, will fly off the moment it is ſet at liberty by ſlipping one end of the ſling cord; and will go on in a line touching the circle it deſcribed before; which line would actually be a ſtraight one, if the earth's attraction did not affect the pebble, and bring it down to the ground. This ſhews, that the natural tendency of the pebble, when put

put into motion, is to continue moving in a ſtraight line, although by the force that moves the ſling it be made to revolve in a circle.

The change of motion produced is in proportion to the force impreſſed: for the effects of natural cauſes are always proportionate to the force or power of thoſe cauſes.

By theſe laws it is eaſy to prove that a body will deſcribe the diagonal of a ſquare or parallelogram, by two forces conjoined, in the ſame time that it would deſcribe either of the ſides by one force ſingly. Thus, ſuppoſe the body A (fig. 7.) to repreſent a ſhip at ſea; and that it is drove by the wind, in the right line AB, with ſuch a force as would carry it uniformly from A to B in a minute: then, ſuppoſe a ſtream or current of water running in the direction AD, with ſuch a force as would carry the ſhip through an equal ſpace from A to D in a minute. By theſe two forces, acting together at right angles to each other, the ſhip will deſcribe the line AEC in a minute: which line (becauſe the forces are equal and perpendicular to each other,) willl be the diagonal of an exact ſquare. To confirm this law by an experiment, let there be a wooden ſquare ABCD (fig. 8.) ſo contrived, as to have the part BEFC made to draw out or puſh into the ſquare at pleaſure. To this part let the pulley H be joined, ſo as to turn freely on an axis, which will be at H when the piece is puſhed in, and at *b* when it is drawn out. To this part let the ends of a ſtraight wire *k* be fixed, ſo as to move along with it, under the pulley: and let the ball G be made to ſlide eaſily on the wire. A thread *m* is fixed to this ball, and goes over the pulley to I; by this thread the ball may be drawn up on the wire, parallel to the ſide AD, when the part BEFC is puſhed as far as it will go into the ſquare. But, if this part be drawn out, it will carry the ball along with it, parallel to the bottom of the ſquare DC. By this means, the ball G may either be drawn pependicularly upward by pulling the thread *m*, or moved horiſontally along by pulling out the part BEFC, in equal times, and through equal ſpaces; each power acting equably and ſeparately upon it. But if, when the ball is at G, the upper end of the thread be tied to the pin I, in the corner A of the fixed ſquare, and the moveable part BEFG be drawn out, the ball will then be acted upon by both the powers together: for it will be drawn up by the thread towards the top of the ſquare, and at the ſame time carried with its wire *k* towards the right hand BC, moving all the while in the diagonal line L; and will be found at *g* when the ſliding part is drawn out as far as it was before, which then will have cauſed the thread to draw up the ball to the top of the inſide of the ſquare, juſt as high as it was before, when drawn up ſingly by the thread without moving the ſliding part.

If the acting forces are equal, but at oblique angles to each other, ſo will the ſides of the parallelogram be: and the diagonal run through by the moving body will be longer or ſhorter, according as the obliquity is greater or ſmaller. Thus, if two equal forces act conjointly upon the body A, (fig. 9) one having a tendency to move it through the ſpace AB in the ſame time that the other has a tendency to move it through an equal ſpace AD; it will deſcribe the diagonal AGC in the ſame time that either of the ſingle forces would have cauſed it to deſcribe either of the ſides. If one of the forces be greater than the other, then one ſide of the parallelogram will be ſo much longer than the other. For if one force ſingly would carry the body through the ſpace AE, in the ſame time that the other would have carried the ſpace AD, the joint action of both will carry it in the ſame time through the ſpace AHF, which is the diagonal of the oblique parallelogram ADEF.

If both forces act upon the body in ſuch a manner, as to move it uniformly, the diagonal deſcribed will be a ſtraight line; but if one of the forces acts in ſuch a manner as to make the body move faſter and faſter as it goes forward, then the line deſcribed will be a curve. And this is the caſe of all bodies which are projected in rectilineal directions, and at the ſame time acted upon by the power of gravity, which has a conſtant tendency to accelerate their motions in the direction wherein it acts.

Laws of the Planetary motions.

From the uniform projectile motion of bodies in ſtraight lines, and the univerſal power of gravity or attraction, ariſes the curvilineal motion of all the heavenly bodies. If the body A (fig. 10.) be projected along the ſtraight line AFH in open ſpace, where it meets with no reſiſtance, and is not drawn aſide by any power, it will go on for ever with the ſame velocity, and in the ſame direction. But if, at the ſame moment the projectile force is given it at A, the body S begins to attract it with a force duly adjuſted*, and perpendicular to its motion at A, it will then be drawn from the ſtraight line AFH, and forced to revolve about S in the circle ATW; in the ſame manner, and by the ſame law, that a pebble is moved round in a ſling. And if, when the body is in any part of its orbit (as ſuppoſe at K) a ſmaller body as L, within the ſphere of attraction of the body K, be projected in the right line LM, with a force duly adjuſted, and perpendicular to the line of attraction LK; then, the ſmall body L will revolve about the large body K in the orbit NO, and accompany it in its whole courſe round the yet larger body S. But then, the body K will no longer move in the circle ATW; for that circle will now be deſcribed by the common centre of gravity between K and L. Nay, even the great body S will not keep in the centre; for it will be the common centre of gravity between all the three bodies S, K, and L, that will remain immoveable there. So, if we ſuppoſe S and K connected by a wire P that has no weight, and K and L connected by a wire *q* that has no weight, the common centre of gravity of all theſe three bodies will be a point in the wire P near S; which point being ſupported, the bodies will be all in *equilibrio* as they move round it. Though indeed, ſtrictly ſpeaking, the common centre of gravity of all the three bodies will not be in the wire

* To make the projectile force a juſt balance to the gravitating power, ſo as to keep the planet moving in a circle, it muſt give ſuch a velocity as the planet would acquire by gravity when it had fallen through half the ſemidiameter of that circle.

P but when these bodies are all in a right line. Here, S may represent the sun, K the earth, and L the moon.

In order to form an idea of the curves described by two bodies revolving about their common centre of gravity, whilst they themselves with a third body are in motion round the common centre of gravity of all the three; let us first suppose E (Plate CVI. fig. 1.) to be the sun, and *e* the earth going round him with any moon; and their moving forces regulated as above. In this case, whilst the earth goes round the sun in the dotted circle RTUWX, *&c.* the sun will go round the circle ABD, whose centre C is the common centre of gravity between the sun and and earth: the right line $\beta\delta$ representing the mutual attraction between them, by which they are as firmly connected as if they were fixed at the two ends of an iron bar strong enough to hold them. So, when the earth is at *e*, the sun will be at E; when the earth is at T, the sun will be at F; and when the earth is at *g*, the sun will be at G, *&c.*

Now, let us take in the moon *q* (at the top of the figure,) and suppose the earth to have no progressive motion about the sun; in which case, whilst the moon revolves about the earth in her orbit 𝔄𝔅ℭ𝔇, the earth will revolve in the circle S 13, whose centre R is the common centre of gravity of the earth and moon; they being connected by the mutual attraction between them in the same manner as the earth and sun are.

But the truth is, that whilst the moon revolves about the earth, the earth is in motion about the sun; and now, the moon will cause the earth to describe an irregular curve, and not a true circle, round the sun; it being the common centre of gravity of the earth and moon that will then describe the same circle which the earth would have moved in, if it had not been attended by a moon. For, supposing the moon to describe a quarter of her progressive orbit about the earth in the time that the earth moves from *e* to *f*, it is plain that when the earth comes to *f*, the moon will be found at *r*; in which time, their common centre of gravity will have described the dotted arc R1T, the earth the curve R5*f*, and the moon the curve *q*14*r*. In the time that the moon describes another quarter of her orbit, the centre of gravity of the earth and moon will describe the dotted arc T2U, the earth the curve *f*6*g*, and the moon the curve *r*15*s*, and so on.—And thus, whilst the moon goes once round the earth in her progressive orbit, their common centre of gravity describes the regular portion of a circle R1T2U3V4W, the earth the irregular curve R5*f*6*g*7*h*8*i*, and the moon the yet more irregular curve *q*14*r*15*s*16*t*17*u*; and then, the same kind of tracks over again.

The centre of gravity of the earth and moon is 6000 miles from the earth's centre towards the moon; therefore the circle S 13 which the earth describes round that centre of gravity (in every course of the moon round her orbit) is 12000 miles in diameter. Consequently, the earth is 12000 miles nearer the sun at the time of full moon than at the time of new. [See the earth at *f* and at *h*.]

To avoid confusion in so small a figure, we have supposed the moon to go only twice and a half round the earth, in the time that the earth goes once round the sun: it being impossible to take in all the revolutions which she makes in a year; and to give a true figure of her path, unless we should make the semidiameter of the earth's orbit at least 84 inches; and then, the proportional semidiameter of the moon's orbit would be only a quarter of an inch.

If the moon made any complete number of revolutions about the earth in the time that the earth makes one revolution about the sun, the paths of the sun and moon would return into themselves at the end of every year; and so be the same over again: but they return not into themselves in less than 19 years nearly; in which time, the earth makes nearly 19 revolutions about the sun, and the moon 235 about the earth.

If the planet A (Plate CV. fig. 10.) be attracted towards the sun, with such a force as would make it fall from A to B, in the time that the projectile impulse would have carried it from A to F, it will describe the arc AG by the combined action of these forces, in the same time that the former would have caused it to fall from A to B, or the latter have carried it from A to F. But, if the projectile force had been twice as great, that is, such as would have carried the planet from A to H, in the same time that now, by the supposition, it carries it only from A to F; the sun's attraction must then have been four times as strong as formerly, to have kept the planet in the circle ATW; that is, it must have been such as would have caused the planet to fall from A to E, which is four times the distance of A from B, in the time that the projectile force singly would have carried it from A to H, which is only twice the distance of A from F. Thus, a double projectile force will balance a quadruple power of gravity in the same circle; as appears plain by the figure, and shall soon be confirmed by an experiment.

Plate CVI. fig. 2. The whirling-table is a machine contrived for shewing experiments of this nature. AA is a strong frame of wood, B a winch or handle fixed on the axis C of the wheel D, round which is the catgut string F, which also goes round the small wheels G and K, crossing between them and the great wheel D. On the upper end of the axis of the wheel G, above the frame, is fixed the round board *d*, to which the bearer MSX may be fastened occasionally, and removed when it is not wanted. On the axis of the wheel H is fixed the bearer NTZ: and it is easy to see, that when the winch B is turned, the wheels and bearers are put into a whirling motion.

Each bearer has two wires, W,X, and Y,Z, fixed and screwed tight into them at the ends by nuts on the outside. And when these nuts are unscrewed, the wires may be drawn out in order to change the balls U and V, which slide upon the wires by means of brass loops fixed into the balls, which keep the balls up from touching the wood below them. A strong silk line goes through each ball, and is fixed to it at any length from the centre of the bearer to its end, as occasion requires, by a nut-screw at the top of the ball; the shank of the screw going into the centre of the ball and pressing the line against the under side of the hole that it goes through.—The line goes from the ball, and under a small pulley fixt in the middle of the bearer; then up through a socket in the round plate

Plate CV.

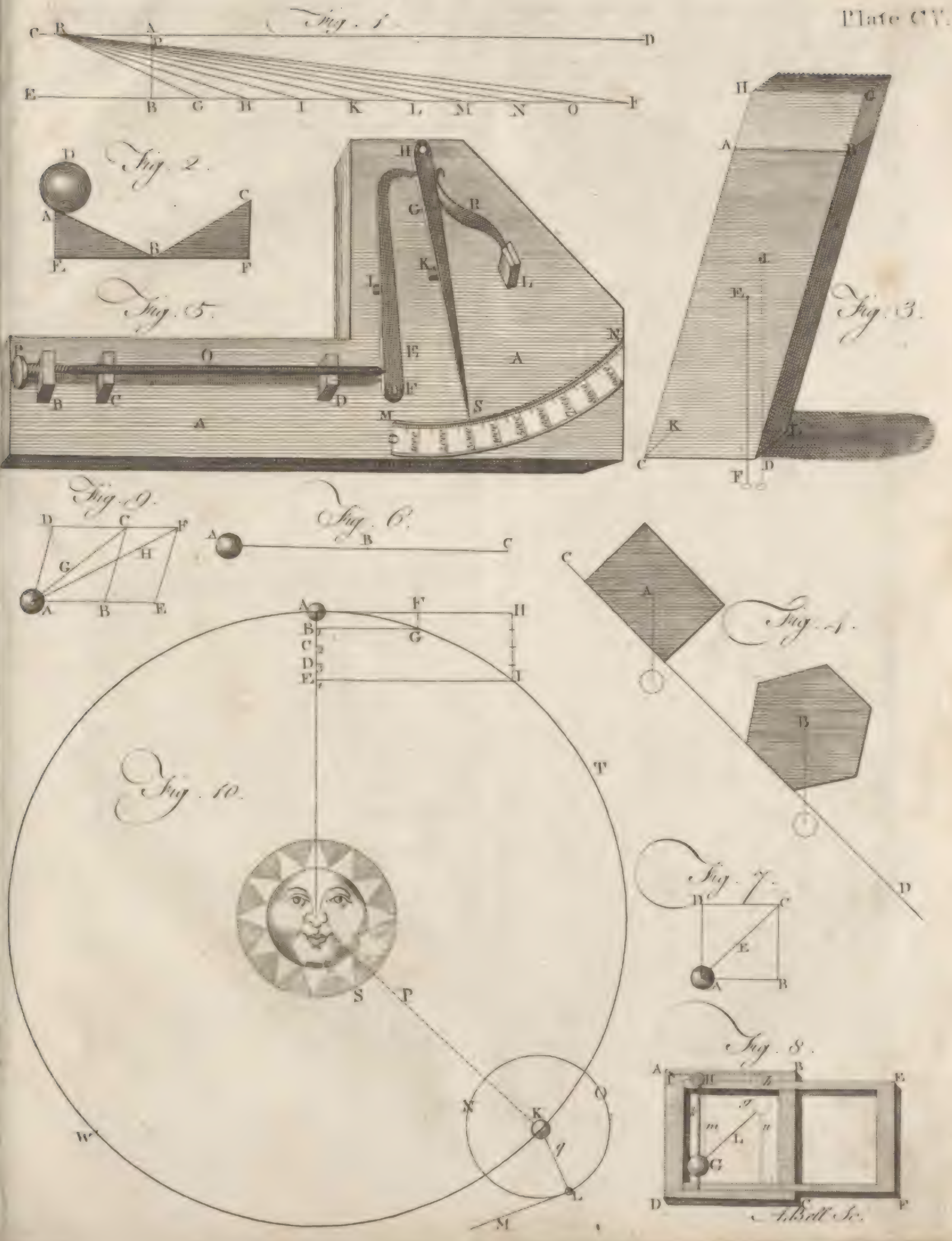


plate (see S and T) in the middle of each bearer; then through a slit in the middle of the square top (O and P) of each tower, and, going over a small pulley on the top, comes down again the same way, and is at last fastened to the upper end of the socket fixt in the middle of the above-mentioned round plate. These plates S and T have each four round holes near their edges for letting them slide up and down upon the wires which make the corner of each tower. The balls and plates being thus connected each by its particular line, it is plain, that if the balls be drawn outward, or towards the ends M and N of their respective bearers, the round plates S and T will be drawn up to the top of their respective towers O and P.

There are several brass weights, some of two ounces, some of three, and some of four, to be occasionally put within the towers O and P, upon the round plates S and T: each weight having a round hole in the the middle of it, for going upon the sockets or axes of the plates, and is slit from the edge to the hole, for allowing it to be slipt over the foresaid line which comes from each ball to its respective plate.

The experiments to be made by this machine are,

1. Take away the bearer MX, and take the ivory ball *a*, to which the line or silk cord *b* is fastened at one end; and having made a loop on the other end of the cord, put the loop over a pin fixt in the centre of the board *d*. Then, turning the winch B to give the board a whirling motion, you will see that the ball does not immediately begin to move with the board; but, on account of its inactivity, it endeavours to continue in the state of rest which it was in before.—Continue turning, until the board communicates an equal degree of motion with its own to the ball; and then turning on, you will perceive that the ball will remain upon one part of the board, keeping the same velocity with it, and having no relative motion upon it, as is the case with every thing that lies loose upon the plane surface of the earth, which having the motion of the earth communicated to it, never endeavours to remove from that place. But stop the board suddenly by hand, and the ball will go on, and continue to revolve upon the board, until the friction thereof stops its motion: which shews, that matter being once put into motion, would continue to move for ever, if it met with no resistance. In like manner, if a person stands upright in a boat before it begins to move, he can stand firm; but the moment the boat sets off, he is in danger of falling towards that place which the boat departs from: because, as matter, he has no natural propensity to move. But when he acquires the motion of the boat, let it be ever so swift, if it be smooth and uniform, he will stand as upright and firm as if he was on the plain shore; and if the boat strike against any obstacle, he will fall towards that obstacle; on account of the propensity he has, as matter, to keep the motion which the boat has put him into.

2. Take away this ball, and put a longer cord to it, which may be put down through the hollow axis of the bearer MX, and wheel G. and fix a weight to the end of the cord below the machine; which weight, if left at liberty, will draw the ball from the edge of the whirling-board to its centre.

Draw off the ball a little from the centre, and turn the winch; then the ball will go round and round with the board, and will gradually fly off farther and farther from the centre, and raise up the weight below the machine: which shews that all bodies revolving in circles have a tendency to fly off from these circles, and must have some power acting upon them from the centre of motion, to keep them from flying off. Stop the machine, and the ball will continue to revolve for some time upon the board; but as the friction gradually stops its motion, the weight acting upon it will bring it nearer and nearer to the centre in every revolution, until it brings it quite thither. This shews, that if the planets met with any resistance in going round the sun, its attractive power would bring them nearer and nearer to it in every revolution, until they fell into it.

3. Take hold of the cord below the machine with one hand, and with the other throw the ball upon the round board as it were at right angles to the cord, by which means it will go round and round upon the board. Then, observing with what velocity it moves, pull the cord below the machine, which will bring the ball nearer to the centre of the board, and you will see that the nearer the ball is drawn to the centre, the faster it will revolve; as those planets which are nearest the sun revolve faster than those which are more remote; and not only go round sooner, because they describe smaller circles, but even move faster in every part of their respective circles.

Take away this ball, and apply the bearer MX, whose centre of motion is in its middle at *w*, directly over the centre of the whirling-board *d*. Then put two balls (V and U) of equal weights upon their bearing wires; and having fixed them at equal distances from their respective centres of motion *w* and *x* upon their silk cords, by the screw-nuts, put equal weights in the towers O and P. Lastly, put the catgut strings E and F upon the grooves G and H of the small wheels; which being of equal diameters, will give equal velocities to the bearers above, when the winch B is turned; and the balls U and V will fly off towards M and N, and will raise the weights in the towers at the same instant. This shews, that when bodies of equal quantities of matter revolve in equal circles with equal velocities, their centrifugal forces are equal.

5. Take away these equal balls, and, instead of them, put a ball of six ounces into the bearer MX, at a sixth part of the distance *wz* from the centre, and put a ball of one ounce into the opposite bearer, at the whole distance *xy*, which is equal to *wz* from the centre of the bearer; and fix the ball at these distances on their cords, by the screw-nuts at top; then the ball U, which is six times as heavy as the ball V, will be at only a sixth part of the distance from its centre of motion; and consequently will revolve in a circle of only a sixth part of the circumference of the circle in which V revolves. Now, let any equal weights be put into the towers and the machine be turned by the winch; which (as the catgut string is on equal wheels below) will cause the balls to revolve in equal times; but V will move six times as fast as U, because it revolves in a circle of six times its radius; and both the weights in the towers will rise at once. This shews, that the centrifugal forces of revolving bodies, (or their

their tendencies to fly off from the circles they describe) are in direct proportion to their quantities of matter multiplied into their respective velocities, or into their distances from the centres of their respective circles. For, supposing U, which weighs 6 ounces, to be two inches from its centre of motion *w*, the weight multiplied by the distance is 12; and supposing V, which weighs only one ounce, to be 12 inches distant from its centre of motion *x*; the weight 1 ounce multiplied by the distance 12 inches is 12. And as they revolve in equal times, their velocities are as their distances from the centre, namely, as 1 to 6.

If these two balls be fixed at equal distances from their respective centres of motion, they will move with equal velocities; and if the tower O has 6 times as much weight put into it as the tower P has, the balls will raise their weight at the same moment. This shews, that the ball U, being six times as heavy as the ball V, has six times as much centrifugal force, in describing an equal circle with an equal velocity.

6. If bodies of equal weights revolve in equal circles with unequal velocities, their centrifugal forces are as the squares of the velocities. To prove this law by an experiment, let two balls U and V of equal weights be fixed on their cords at equal distances from their respective centres of motion *w* and *x*: and then let the catgut string E be put round the wheel K (whose circumference is only one half of the circumference of the wheel H or G) and over the pulley *s* to keep it tight; and let four times as much weight be put in the tower P as in the tower O. Then turn the winch B, and the ball V will revolve twice as fast as the ball U in a circle of the same diameter, because they are equidistant from the centres of the circles in which they revolve; and the weights in the towers will both rise at the same instant; which shews, that a double velocity in the same circle will exactly balance a quadruple power of attraction in the centre of the circle. For the weights in the towers may be considered as the attractive forces in the centres, acting upon the revolving balls; which, moving in equal circles, is the same thing as if they both moved in one and the same circle.

7. If bodies of equal weights revolve in unequal circles, in such a manner that the squares of the times of their going round are as the cubes of their distances from the centres of the circles they describe; their centrifugal forces are inversely as the squares of their distances from those centres. For, the catgut string remaining as in the last experiment, let the distance of the ball V from the centre *x* be made equal to two of the cross divisions on its bearer, and the distance of the ball U from the centre *w* be three and a sixth part; the balls themselves being of equal weights, and V making two revolutions by turning the winch in the time that U makes one: so that if we suppose the ball V to revolve in one moment, the ball U will revolve in two moments, the squares of which are one and four: for the square of 1 is only 1, and the square of 2 is 4; therefore the square of the period or revolution of the ball V is contained 4 times in the square of the ball U. But the distance of V is 2, the cube of which is 8; and the distance of U is $3\frac{1}{6}$, the cube of which is 32 very nearly; in which 8 is contained four times; and therefore, the squares of the periods of V and U are to one another as the cubes of their distances from *x* and *w*, which are the centres of their respective circles. And if the weight in the tower O be four ounces, equal to the square of 2, the distance of V from the centre *x*; and the weight in the tower P be 10 ounces, nearly equal to the square of $3\frac{1}{6}$, the distance of U from *w*; it will be found, upon turning the machine by the winch, that the balls U and V will raise their respective weights at very nearly the same instant of time. Which confirms that famous proposition of KEPLER, *viz.* That the squares of the periodical times of the planets round the sun are in proportion to the cubes of their distances from him; and that the sun's attraction is inversely as the square of the distance from its centre: that is, at twice the distance, his attraction is four times less; and thrice the distance, nine times less; at four times the distance, sixteen times less; and so on, to the remotest part of the system.

8. Take off the catgut string E from the great wheel D and the small wheel H, and let the string F remain upon the wheels D and G. Take away also the bearer MX from the whirling-board *d*, and instead thereof put the machine AB (fig. 4.) upon it, fixing this machine to the centre of the board by the pins *c* and *d*, in such a manner, that the end *ef* may rise above the board to an angle of 30 or 40 degrees. In the upper side of this machine there are two glass tubes *a* and *b*, close stopt at both ends; and each tube is about three quarters full of water. In the tube *a* is a little quicksilver, which naturally falls down to the end *a* in the water, because it is heavier than its bulk of water; and on the tube *b* is a small cork which floats upon the top of the water at *e*, because it is lighter; and it is small enough to have liberty to rise or fall in the tube. While the board *b* with this machine upon it continues at rest, the quicksilver lies at the bottom of the tube *a*, and the cork floats on the water near the top of the tube *b*. But, upon turning the winch, and putting the machine in motion, the contents of each tube will fly off towards the uppermost ends (which are farthest from the centre of motion) the heaviest with the greatest force. Therefore, the quicksilver in the tube *a* will fly off quite to the end *f*, and occupy its bulk of space there, excluding the water from that place, because it is lighter than quicksilver; but the water in the tube *b* flying off to its higher end *e*, will exclude the cork from that place, and cause the cork to descend towards the lowermost end of the tube, where it will remain upon the lowest end of the water near *b*; for the heavier body having the greater centrifugal force, will therefore possess the uppermost part of the tube; and the lighter body will keep between the heavier and the lowermost part.

This demonstrates the absurdity of the Cartesian doctrine of the planets moving round the sun in vortexes: for, if the planet be more dense or heavy than the bulk of the vortex, it will fly off therein, farther and farther from the sun; if less dense, it will come down to the lowest part of the vortex, at the sun: and the whole vortex itself must be surrounded with something like a great wall, otherwise it would fly off, planets and all together. But

But while gravity exists, there is no occasion for such vortexes; and when it ceases to exist, a stone thrown upwards will never return to the earth again.

9. If a body be so placed upon the whirling board of the machine (fig. 1.) that the centre of gravity of the body be directly over the centre of the board, and the board be put into ever so rapid a motion by the winch B, the body will turn round with the board, but will not remove from the middle of it: for, as all parts of the body are in *equilibrio* round its centre of gravity, and the centre of gravity is at rest in the centre of motion, the centrifugal force of all parts of the body will be equal at equal distances from its centre of motion; and therefore the body will remain in its place. But if the centre of gravity be placed ever so little out of the centre of motion, and the machine be turned swiftly round, the body will fly off towards that side of the board on which its centre of gravity lies. Thus, if the wire C (fig. 5.) with its little ball B be taken away from the demi-globe A, and the flat side *ef* of this demi-globe be laid upon the whirling-board of the machine, so as their centres may coincide; if then the board be turned ever so quick by the winch, the demi globe will remain where it was placed. But if the wire C be screwed in the demi-globe at *d*, the whole becomes one body, whose centre of gravity is now at or near *d*. Let the pin *c* be fixed in the centre of the whirling-board, and the deep groove *b* cut in the flat side of the demi-globe be put upon the pin, so as the pin may be in the centre of A [See fig. 6. where this groove is represented at *b*] and let the whirling board be turned by the winch, which will carry the little ball B (fig. 5.) with its wire C, and the demi-globe A, all round the centre-pin *ci*; and then the centrifugal force of the little ball B, which weighs only one ounce, will be so great, as to draw off the demi-globe A, which weighs two pounds, until the end of the groove at *e* strikes against the pin *c*, and so prevents the demi-globe A from going any farther; otherwise, the centrifugal force of B would have been great enough to have carried A quite off the whirling-board. Which shews, that if the sun were placed in the very centre of the orbits of the planets, it could not possibly remain there; for the centrifugal forces of the planets would carry them quite off, and the sun with them; especially when several of them happened to be in any one quarter of the heavens. For the sun and planets are as much connected by the mutual attraction that subsists between them, as the bodies A and B are by the wire C which is fixed to them both. And even if there were but one single planet in the whole heavens to go round ever so large a sun in the centre of its orbit, its centrifugal force would soon carry off both itself and the sun. For, the greatest body placed in any part of free space could be easily moved: because if there were no other body to attract it, it could have no weight or gravity of itself; and consequently, though it could have no tendency of itself to remove from that part of space, yet it might be very easily by any other substance. And perhaps it was this consideration which made the celebrated ARCHIMEDES say, that if he had a proper place at some distance from the earth whereon to fix his machinery, he could move the whole earth.

10. As the centrifugal force of the light body B will not allow the heavy body A to remain in the centre of motion, even though it be 24 times as heavy as B; let us now take the ball A (fig 7.) which weighs 6 ounces, and connect it by the wire C with the ball B, which weighs only one ounce; and let the fork E be fixed into the centre of the whirling-board; then, hang the balls upon the fork by the wire C in such a manner that they may exactly balance each other; which will be when the centre of gravity between them, in the wire at *d*, is supported by the fork. And this centre of gravity is as much nearer to the centre of the ball A, than to the centre of the ball B, as A is heavier than B, allowing for the weight of the wire on each side of the fork. This done, let the machine be put into motion by the winch; and the balls A and B will go round their common centre of gravity *d*, keeping their balance, because either will not allow the other to fly off with it. For, supposing the ball B to be only one ounce in weight, and the ball A to be six ounces; then, if the wire C were equally heavy on each side of the fork, the centre of gravity *d* would be six times as far from the centre of the ball B as from the centre of the ball A, and consequently B will revolve with a velocity six times as great as A does; which will give B six times as much centrifugal force as any single ounce of A has: but then, as B is only one ounce, and A six ounces, the whole centrifugal force of A will exactly balance the whole centrifugal force of B; and therefore, each body will detain the other so as to make it keep in its circle. This shews that the sun and planets must all move round the common centre of gravity of the whole system, in order to preserve that just balance which takes place among them. For, the planets being as unactive and dead as the above balls, they could no more have put themselves into motion than these balls can; nor have kept in their orbits, without being balanced at first with the greatest degree of exactness upon their common centre of gravity by the Almighty Hand that made them and put them in motion.

Perhaps it may be here asked, that since the centre of gravity between these balls must be supported by the fork E in this experiment, what prop it is that supports the centre of gravity of the solar system, and consequently bears the weight of all the bodies in it; and by what is the prop itself supported? The answer is easy and plain; for the centre of gravity of our balls must be supported, because they gravitate towards the earth, and would therefore fall to it: but as the sun and planets gravitate only towards one another, they have nothing else to fall to; and therefore have no occasion for any thing to support their common centre of gravity: and if they did not move round that centre, and consequently acquire a tendency to fly of from it by their motions, their mutual attractions would soon bring them together; and so the whole would become one mass in the sun: which would also be the case if their velocities round the sun were not quick enough to create a centrifugal force equal to the sun's attraction.

But after all this nice adjustment, it appears evident, that the Deity cannot withdraw his regulating hand from his works, and leave them to be solely governed by the laws

laws which he has impreſſed upon them at firſt. For if he ſhould once leave them ſo, their order would in time come to an end; becauſe the planets muſt neceſſarily diſturb one another's motions by their mutual attractions, when ſeveral of them are in the ſame quarter of the heavens; as is often the caſe: and then, as they attract the ſun more towards that quarter than when they are in a manner diſperſed equably arround him, if he was not at that time made to deſcribe a portion of a larger circle round the common centre of gravity, the balance would then be immediately deſtroyed; and as it could never reſtore itſelf again, the whole ſyſtem would begin to fall together, and would in time unite in a maſs at the ſun. —Of this diſturbance we have a very remarkable inſtance in the comet which appeared lately; and which, in going laſt up before from the ſun, went ſo near to Jupiter, and was ſo affected by his attraction, as to have the figure of its orbit much changed; and not only ſo, but to have its period altered, and its courſe to be different in the heavens from what it was laſt before.

11. Take away the fork and balls from the whirling-board, and place the trough AB (fig. 8.) thereon, fixing its centre to the centre of the whirling-board by the pin H. In this trough are two balls D and E, of unequal weights, connected by a wire *f*; and made to ſlide eaſily upon the wire C ſtretched from end to end of the trough, and made faſt by nut-ſcrews on the outſide of the ends. Let theſe balls be ſo placed upon the wire C, that their common centre of gravity *g* may be directly over the centre of the whirling board. Then, turn the machine by the winch ever ſo ſwiftly, and the trough and balls will go round their centre of gravity ſo as neither of them will fly off; becauſe, on account of the equilibrium, each ball detains the other with an equal force acting againſt it. But if the ball E be drawn a little more towards the end of the trough at A, it will remove the centre of gravity towards that end from the centre of motion; and then, upon turning the machine, the little ball E will fly off, and ſtrike with a conſiderable force againſt the end A, and draw the great ball B into the middle of the trough. Or, if the great ball D be drawn towards the end B of the trough, ſo that the centre of gravity may be a little towards that end from the centre of motion, and the machine be turned by the winch, the great ball D will fly off, and ſtrike violently againſt the end B of the trough, and will bring the little ball E into the middle of it. If the trough be not made very ſtrong, the ball D will break through it.

12. The reaſon why the tides riſe at the ſame abſolute time on oppoſite ſides of the earth, and conſequently in oppoſite directions, is made abundantly plain by a new experiment on the whirling table. The cauſe of their riſing on the ſide next the moon every one underſtands to be owing to the moon's attraction: but why they ſhould riſe on the oppoſite ſide at the ſame time, where there is no moon to attract them, is perhaps not ſo generally underſtood. For it would ſeem that the moon ſhould rather draw the waters (as it were) cloſer to that ſide, than raiſe them upon it, directly contrary to her attractive force. Let the circle *abcd* (fig. 9.) repreſent the earth, with its ſide *c* turned toward the moon, which will then attract the waters ſo as to raiſe them from *c* to *g*. But the queſtion is, why ſhould they riſe as high at that very time on the oppoſite ſide, from *a* to *e*? In order to explain this, let there be a plate AB (fig. 10.) fixed upon one end of the flat bar DC; with ſuch a circle drawn upon it as *abcd* (in fig. 9.) to repreſent the round figure of the earth and ſea; and ſuch an ellipſis as *efgh* to repreſent the ſwelling of the tide at *e* and *g*, occaſioned by the influence of the moon. Over this plate AB let the three ivory balls *e,f,g* be hung by the ſilk lines *h,i,k*, faſtened to the tops of the crooked wires H,I,K, in ſuch a manner, that the ball at *e* may hang freely over the ſide of the circle *e*, which is fartheſt from the moon M (at the other end of the bar;) the ball at *f* may hang freely over the centre, and the ball at *g* hang over the ſide of the circle *g*, which is neareſt the moon. The ball *f* may repreſent the centre of the earth, the ball *g* ſome water on the ſide next the moon, and the ball *e* ſome water on the oppoſite ſide. On the back of the moon M is fixt the ſhort bar N parallel to the horizon, and there are three holes in it above the little weights *p,q,r*. A ſilk thread *o* is tied to the line *k* cloſe above the ball *g*, and, paſſing by one ſide of the moon M, goes through a hole in the bar N, and has the weight *p* hung to it. Such another thread *n* is tied to the line *i*, cloſe above the ball *f*, and, paſſing through the centre of the moon M and middle of the bar N, has the weight *q* hung to it, which is lighter than the weight *p*. A third thread *m* is tied to the line *h*, cloſe above the ball *e*, and paſſing by the other ſide of the moon M, through the bar N, has the weight *r* hung to it, which is lighter than the weight *q*.

The uſe of theſe three unequal weights is to repreſent the moon's unequal attraction at different diſtances from her. With whatever force ſhe attracts the centre of the earth, ſhe attracts the ſide next her with a greater degree of force, and the ſide fartheſt from her with a leſs. So, if the weights are left at liberty, they will draw all the three balls towards the moon with different degrees of force, and cauſe them to make the appearance ſhewn in (fig. 11.) by which means they are evidently farther from each other than they would be if they hung at liberty by the lines *h,i,k*; becauſe the lines would then hang perpendicularly. This ſhews, that as the moon attracts the ſide of the earth which is neareſt her with a greater degree of force than ſhe does the centre of the earth, ſhe will draw the water on that ſide more than ſhe draws the centre, and ſo cauſes it to riſe on that ſide: and as ſhe draws the centre more than ſhe draws the oppoſite ſide, the centre will recede farther from the ſurface of the water on that oppoſite ſide, and ſo leave it as high there as ſhe raiſed it on the ſide next to her. For, as the centre will be in the middle between the tops of the oppoſite elevations, they muſt of courſe be equally high on both ſides at the ſame time.

But upon this ſuppoſition the earth and moon would ſoon come together; and to be ſure they would, if they had not a motion round their common centre of gravity, to create a degree of centrifugal force ſufficient to balance their mutual attraction. This motion they have; for as the moon goes round her orbit every month, at the

Plate CVI

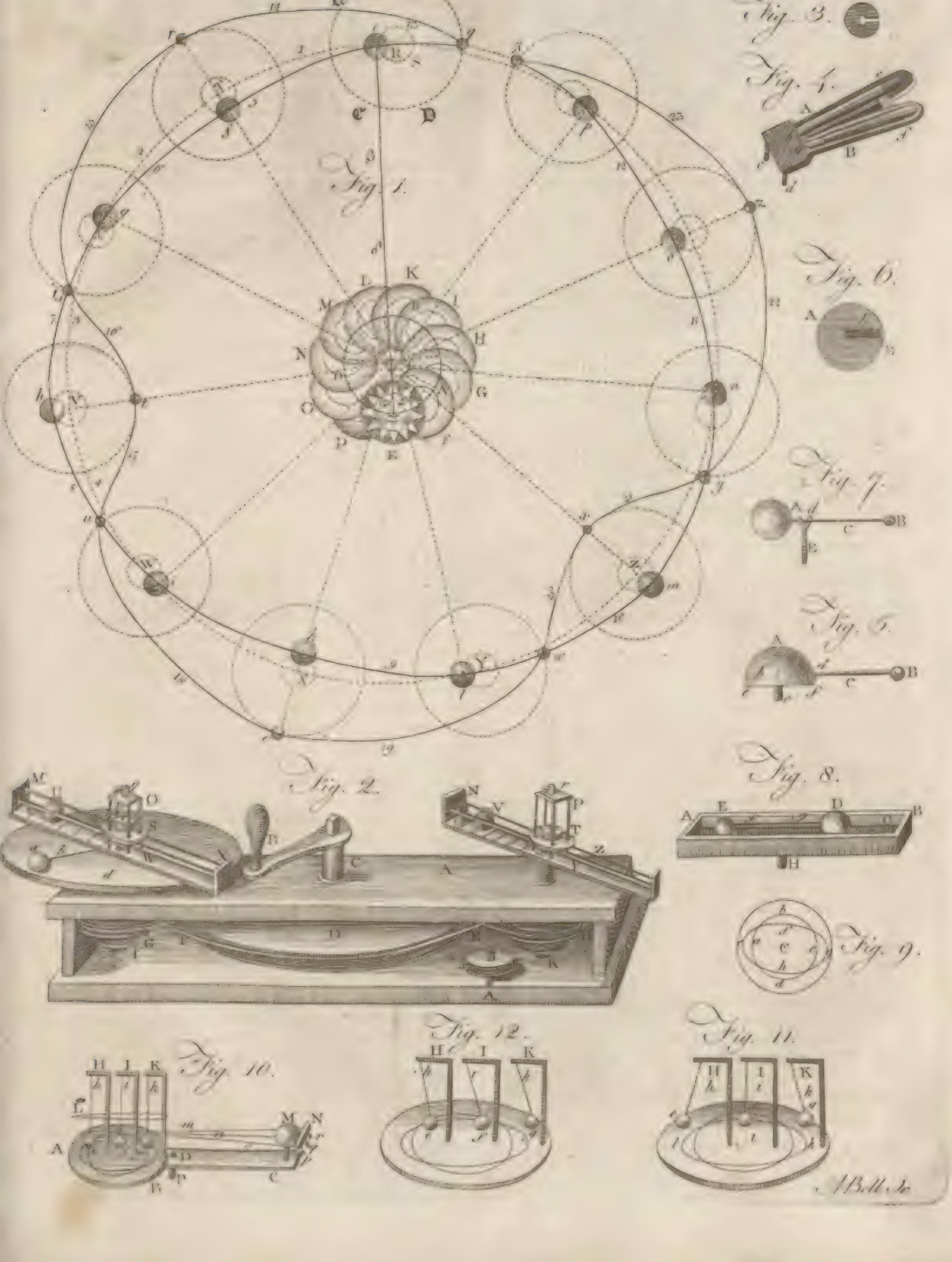


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
J. Bell Sc

the distance of 240000 miles from the earth's centre, and of 234000 miles from the centre of gravity of the earth and moon, so does the earth go round the same centre of gravity every month at the distance of 6000 miles from it; that is, from it to the centre of the earth. Now as the earth is (in round numbers) 8000 miles in diameter, it is plain that its side next the moon is only 2000 miles from the common centre of gravity of the earth and moon; its centre 6000 miles distant therefrom; and its farthest side from the moon 10000. Therefore the centrifugal forces of these parts are as 2000, 6000, and 10000; that is, the centrifugal force of any side of the earth, when it is turned from the moon, is five times as great as when it is turned towards the moon. And as the moon's attraction (exprest by the number 6000) at the earth's centre keeps the earth from flying out of this monthly circle, it must be greater than the centrifugal force of the waters on the side next her; and consequently, her greater degree of attraction on that side is sufficient to raise them; but as her attraction on the opposite side is less than the centrifugal force of the water there, the excess of this force is sufficient to raise the water just as high on the opposite side.—To prove this experimentally, let the bar DC (fig. 10.) with its furniture be fixed upon the whirling-board of the machine (fig. 2.) by pushing the pin P into the centre of the board; which pin is in the centre of gravity of the whole bar with its three balls *e,f,g*, and moon M. Now, if the whirling-board and bar be turned slowly round by the winch, until the ball *f* hangs over the centre of the circle, as in fig. 11. the ball *g* will be kept towards the moon by the heaviest weight *p*, (fig. 9.) and the ball *e*, on account of its greater centrifugal force, and the lesser weight *r*, will fly off as far to the other side as in fig. 12. And so, whilst the machine is kept turning, the balls *e* and *g* will hang over the ends of the ellipsis *l,f,k*. So that the centrifugal force of the ball *e* will exceed the moon's attraction just as much as her attraction exceeds the centrifugal force of the ball *g*, whilst her attraction just balances the centrifugal force of the ball *f*, and makes it keep in its circle. And hence it is evident that the tides must rise to equal heights at the same time on opposite sides of the earth. This experiment, to the best of my knowledge, is entirely new.

From the principles thus established, it is evident that the earth moves round the sun, and not the sun round the earth: for the centrifugal law will never allow a great body to move round a small one in any orbit whatever; especially when we find, that if a small body moves round a great one, the great one must also move round the common centre of gravity between them two. And it is well known, that the quantity of matter in the sun is 227000 times as great as the quantity of matter in the earth. Now, as the sun's distance from the earth is at least 81,000,000 of miles, if we divide that distance by 227000, we shall have only 357 for the number of miles that the centre of gravity between the sun and earth is distant from the sun's centre. And as the sun's semidiameter is $\frac{1}{4}$ of a degree, which, at so great a distance as that of the sun, must be no less than 381500 miles, if this be divided by 357, the quotient will be $1068\frac{2}{3}$, which shews that the common centre of gravity is within the body of the sun, and is only the $1068\frac{2}{3}$ part of his semidiameter from his centre toward his surface.

All globular bodies, whose parts can yield, and which do not turn on their axes, must be perfect spheres, because all parts of their surfaces are equally attracted toward their centres. But all such globes which do turn on their axes, will be oblate spheroids; that is, their surfaces will be higher, or farther from the centre, in the equatorial than in the polar regions. For, as the equatorial parts move quickest, they must have the greatest centrifugal force; and will therefore recede farthest from the axis of motion. Thus, if two circular hoops AB and CD, (Plate CVII. fig. 1.) made thin and flexible, and crossing one another at right angles, be turned round their axis EF by means of the winch *m*, the wheel *n*, and pinion *o*, and the axis be loose in the pole or intersection *e*, the middle parts A,B,C,D will swell out so as to strike against the sides of the frame at F and G, if the pole *e*, in sinking to the pin E, be not stopt by it from sinking farther: so that the whole will appear of an oval figure, the equatorial diameter being considerably longer than the polar. That our earth is of this figure, is demonstrable from actual measurement of some degrees on its surface, which are found to be longer in the frigid zones than in the torrid: and the difference is found to be such as prove the earth's equatorial diameter to be 35 miles longer than its axis.—Since then, the earth is higher at the equator than at the poles, the sea, which like all other fluids naturally runs downward (or towards the places which are nearest the earth's centre) would run towards the polar regions, and leave the equatorial parts dry, if the centrifugal force of the water, which carried it to those parts, and so raised them, did not detain and keep it from running back again towards the poles of the earth.

Of the Mechanical Powers.

If we consider bodies in motion, and compare them together, we may do this either with respect to the quantities of matter they contain, or the velocities with which they are moved. The heavier any body is, the greater is the power required either to move it or to stop its motion: and again, the swifter it moves, the greater is its force. So that the whole *momentum* or quantity of force of a moving body is the result of its quantity of matter multiplied by the velocity with which it is moved. And when the products arising from the multiplication of the particular quantities of matter in any two bodies by their respective velocities are equal, the *momenta* or entire forces are so too. Thus, suppose a body, which we shall call A, to weigh 40 pounds, and to move at the rate of two miles in a minute; and another body, which we shall call B, to weigh only four pounds, and to move 20 miles in a minute; the entire forces with which these two bodies would strike against any obstacle would be equal to each other, and therefore it would require equal powers to stop them. For 40 multiplied by 2 gives 80, the force of the body A; and 20 multiplied by 4 gives 80, the force of the body B.

Upon this easy principle depends the whole of mechanics

chanics: and it holds univerſally true, that when two bodies are ſuſpended by any machine, ſo as to act contrary to each other: if the machine be put into motion, and the perpendicular aſcent of one body multiplied into its weight, be equal to the perpendicular deſcent of the other body multiplied into its weight, theſe bodies, how unequal ſoever in their weights, will balance one another in all ſituations: for, as the whole aſcent of one is performed in the ſame time with the whole deſcent of the other, their reſpective velocities muſt be directly as the ſpaces they move through; and the exceſs of weight in one body is compenſated by the exceſs of velocity in the other.—Upon this principle it is eaſy to compute the power of any mechanical engine, whether ſimple or compound; for it is but only inquiring how much ſwifter the power moves than the weight does (*i. e.* how much farther in the ſame time,) and juſt ſo much is the power increaſed by the help of the engine.

In the theory of this ſcience, we ſuppoſe all planes perfectly even, all bodies perfectly ſmooth, levers to have no weight, cords to be extremely pliable, machines to have no friction; and in ſhort, all imperfection muſt be ſet aſide until the theory be eſtabliſhed, and then proper allowances are to be made.

The ſimple *machines*, uſually called *mechanical powers*, are ſix in number, viz. the *lever*, the *wheel and axle*, the *pulley*, the *inclined plane*, the *wedge*, and the *ſcrew*. They are called mechanical powers, becauſe they help us to raiſe weights, move heavy bodies, and overcome reſiſtances, which we could not effect without them.

1. A *lever* is a bar of iron or wood, one part of which being ſupported by a prop, all the other parts turn upon that prop as their centre of motion: and the velocity of every part or point is directly as its diſtance from the prop. Therefore, when the weight to be raiſed at one end is to the power applied at the other to raiſe it, as the diſtance of the power from the prop is to the diſtance of the weight from the prop, the power and weight will exactly balance or counterpoiſe each other: and as a common lever has but very little friction on its prop, a very little additional power will be ſufficient to raiſe the weight.

There are four kinds of levers. 1. The common ſort, where the prop is placed between the weight and the power; but much nearer to the weight than to the power. 2. When the prop is at one end of the lever, the power at the other, and the weight between them. 3. When the prop is at one end, the weight at the other, and the power applied between them. 4. The bended lever, which differs only in form from the firſt ſort, but not in property. Thoſe of the firſt and ſecond kind are often uſed in mechanical engines; but there are few inſtances in which the third ſort is uſed.

A *common balance* is a lever of the firſt kind; but as both its ends are at equal diſtances from its centre of motion, they move with equal velocities; and therefore, as it gives no mechanical advantage, it cannot properly be reckoned among the mechanical powers.

A lever of the firſt kind is repreſented by the bar ABC, (Plate CVII. fig. 2.) ſupported by the prop D. Its principal uſe is to looſen large ſtones in the ground, or raiſe great weights to ſmall heights, in order to have ropes put under them for raiſing them higher by other machines. The parts AB and BC, on different ſides of the prop D, are called the arms of the lever: the end A of the ſhorter arm AB being appplied to the weight intended to be raiſed, or to the reſiſtance to be overcome; and the power applied to the end C of the longer arm BC.

In making experiments with this machine, the ſhorter arm AB muſt be as much thicker than the longer arm BC, as will be ſufficient to balance it on the prop. This ſuppoſed, let P repreſent a power whoſe intenſity is equal to one ounce, and W a weight whoſe intenſity is equal to 12 ounces. Then, if the power be 12 times as far from the prop as the weight is, they will exactly counterpoiſe; and a ſmall addition to the power P will cauſe it to deſcend, and raiſe the weight W; and the velocity with which the power deſcends will be to the velocity with which the weight riſes, as 12 to 1: that is, directly as their diſtances from the prop; and conſequently, as the ſpaces through which they move. Hence it is plain, that a man who by his natural ſtrength, without the help of any machine, could ſupoort an hundred weight, will by the help of this lever be enabled to ſupport twelve hundred. If the weight be leſs, or the power greater, the prop may be placed ſo much the farther from the weight; and then it can be raiſed to a proportionably greater height. For univerſally, if the intenſity of the weight multiplied into its diſtance from the prop be equal to the intenſity of the power multiplied into its diſtance from the prop, the power and weight will exactly balance each other; and a little addition to the power will raiſe the weight. Thus, in the preſent inſtance, the weight W is 12 ounces, and its diſtance from the prop is 1 inch; and 12 multiplied by 1 is 12; the power P is equal to 1 ounce, and its diſtance from the prop is 12 inches, which multiplied by one is 12 again: and therefore there is an equilibrium between them. So, if a power equal to 2 ounces be applied at the diſtance of 6 inches from the prop, it will juſt balance the weight W; for 6 multiplied by 2 is 12, as before. And a power equal to 3 ounces placed at 4 inches diſtance from the prop would do the ſame; for 3 times 4 is 12; and ſo on, in proportion.

The *ſtatera*, or Roman *ſteelyard*, is a lever of this kind, contrived for finding the weights of different bodies by one ſingle weight placed at different diſtances from the prop or centre of motion D. For, if a ſcale hangs at A, the extremity of the ſhorter arm AB, and is of ſuch a weight as will exactly counterpoiſe the longer arm BC; if this arm be divided into as many equal parts as it will contain, each equal to AB, the ſingle weight P (which we may ſuppoſe to be 1 pound) will ſerve for weighing any thing as heavy as itſelf, or as many times heavier as there are diviſions in the arm BC, or any quantity between its own weight and that quantity. As for example, if P be 1 pound, and placed at the firſt diviſion 1 in the arm BC, it will balance 1 pound in the ſcale at A: if it be removed to the ſecond diviſion at 2, it will balance 2 pounds in the ſcale; if to the third, 3 pounds: and ſo on to the end of the arm BC. If each of theſe integral diviſions be ſubdivided into as many equal parts as a pound contains ounces, and the weight

P

P be placed at any of these subdivisions, so as to counterpoise what is in the scale, the pounds and odd ounces therein are by that means ascertained.

To this kind of lever may be reduced several sorts of instruments, such as sciſſars, pinchers, snuffers; which are made of two levers acting contrary to one another; their prop or centre of motion being the pin which keeps them together.

In common practice, the longer arm of this lever greatly exceeds the weight of the shorter; which gains great advantage, because it adds so much to the power.

A lever of the second kind has the weight between the prop and the power. In this, as well as the former, the advantage gained is as the distance of the power from the prop to the distance of the weight from the prop: for the respective velocities of the power and weight are in that proportion; and they will balance each other when the intensity of the power multiplied by its distance from the prop is equal to the intensity of the weight multiplied by its distance from the prop. Thus, if AB (fig. 3.) be a lever on which the weight W of 6 ounces hangs at the distance of 1 inch from the prop G, and a power P equal to the weight of one ounce hangs at the end B, 6 inches from the prop, by the cord CD going over the fixed pulley E, the power will just support the weight; and a small addition to the power will raise the weight 1 inch for every 6 inches that the power descends.

This lever shews the reason why two men carrying a burden upon a stick between them, bear unequal shares of the burden in the inverse proportion of their distances from it. For it is well known, that the nearer any of them is to the burden, the greater share he bears of it: and if he goes directly under it, he bears the whole. So, if one man be at G, and the other at P, having the pole or stick AB resting on their shouldets; if the burden or weight W be placed five times as near the man at G, as it is to the man at P, the former will bear five times as much weight as the latter. This is likewise applicable to the case of two horses of unequal strength, to be so yoked, as that each horse may draw a part proportionable to his strength; which is done by dividing the beam so, that the point of traction may be as much nearer to the stronger horse than to the weaker, as the strength of the former exceeds that of the latter.

To this kind of lever may be reduced oars, rudders of ships, doors turning upon hinges, cutting knives which are fixed at the point of the blade, and the like.

If in this lever we suppose the power and weight to change places, so that the power may be between the weight and the prop, it will become a lever of the third kind; in which, that there may be a balance between the power and the weight, the intensity of the power must exceed the intensity of the weight, just as much as the distance of the weight from the prop exceeds the distance of the power from it. Thus, let E (fig. 4.) be the prop of the lever AB, and W a weight of 1 pound, placed 3 times as far from the prop, as the power P acts at F, by the cord C going over the fixed pulley D; in this case, the power must be equal to three pounds, in order to support the weight.

To this sort of lever are generally referred the bones of a man's arm: for when we lift a weight by the hand, the muscle that exerts its force to raise that weight, is fixed to the bone about one tenth part as far below the elbow as the hand is. And the elbow being the centre round which the lower part of the arm turns, the muscle must therefore exert a force ten times as great as the weight that is raised.

As this kind of lever is a disadvantage to the moving power, it is never used but in cases of necessity; such as that of a ladder, which, being fixed at one end, is by the strength of a man's arms reared against a wall; and in clock-work, where all the wheels may be reckoned levers of this kind, because the power that moves every wheel, except the first, acts upon it near the centre of motion by means of a small pinion, and the resistance it has to overcome acts against the teeth round its circumference.

The fourth kind of lever differs nothing from the first, but in being bended for the sake of convenience. ACB (fig. 5.) is a lever of this sort, bended at C, which is its prop, or centre of motion. P is a powet acting upon the longer arm AC at F, by means of the cord DE going over the pulley G; and W is a weight or resistance acting upon the end B of the shorter arm BC. If the power be to the weight as BC is to CF, they are in *equilibrio*. Thus, suppose W to be 5 pounds acting at the distance of one foot from the centre of motion C, and P to be 1 pound acting at F, five feet from the centre C, the power and weight will just balance each other. A hammer drawing a nail is a lever of this sort.

2. The second mechanical power is the *wheel and axle*, in which the power is applied to the circumference of the wheel, and the weight is raised by a rope which coils about the axle as the wheel is turned round. Here it is plain, that the velocity of the power must be to the velocity of the weight, as the circumference of the wheel is to the circumference of the axle: and consequently, the power and weight will balance each other, when the intensity of the power is to the intensity of the weight as the circumference of the axle is to the circumference of the wheel. Let AB (fig. 6.) be a wheel, CD its axle, and suppose the circumference of the wheel to be 8 times as great as the circumference of the axle; then a power P equal to 1 pound hanging by the cord I, which goes round the wheel, will balance a weight W of 8 pounds hanging by the rope K which goes round the axle. And as the friction on the pivots or gudgeons of the axle is but small, a small addition to the power will cause it to descend, and raise the weight: but the weight will rise with only an eighth part of the velocity wherewith the power descends, and consequently through no more than an eighth part of an equal space, in the same time. If the wheel be pulled round by the handles S,S, the power will be increased in proportion to their length. And by this means, any weight may be raised as high as the operator pleases.

To this sort of engine belong all cranes for raising great weights; and in this case, the wheel may have cogs all around it instead of handles, and a small lantern or trundle may be made to work in the cogs, and be turned by

by a winch; which will make the power of the engine to exceed the power of the man who works it, as much as the number of revolutions of the winch exceed thoſe of the axle D, when multiplied by the exceſs of the length of the winch above the length of the ſemidiameter of the axle, added to the ſemidiameter or half-thickneſs of the rope K, by which the weight is drawn up. Thus, ſuppoſe the diameter of the rope and axle taken together to be 12 inches, and conſequently half their diameters to be 6 inches; ſo that the weight W will hang at 6 inches perpendicular diſtance from below the centre of the axle. Now, let us ſuppoſe the wheel AB, which is fixt on the axle, to have 80 cogs, and to be turned by means of a winch ſix inches long, fixt on the axis of a trundle of 8 ſtaves or rounds, working in the cogs of the wheel.—Here it is plain, that the winch and trundle would make 10 revolutions for one of the wheel AB, and its axis D, on which the rope K winds in raiſing the weight W; and the winch being no longer than the ſum of the ſemi-diameters of the great axle and rope, the trundle could have no more power on the wheel, than a man could have by pulling it round by the edge, becauſe the winch would have no greater velocity than the edge of the wheel has, which we here ſuppoſe to be ten times as great as the velocity of the riſing weight; ſo that, in this caſe, the power gained would be as 10 to 1. But if the length of the winch be 12 inches, the power gained will be as 20 to 1: if 18 inches (which is long enough for any man to work by) the power gained would be as 30 to 1; that is, a man could raiſe 30 times as much by ſuch an engine, as he could do by his natural ſtrength without it, becauſe the velocity of the handle of the winch would be 30 times as great as the velocity of the riſing weight; the abſolute force of any engine being in proportion of the velocity of the power to the velocity of the weight raiſed by it.—But then, juſt as much power or advantage as is gained by the engine, ſo much time is loſt in working it. In this ſort of machines it is requiſite to have a ratchet-wheel G on one end of the axle, with a catch H to fall into its teeth; which will at any time ſupport the weight, and keep it from deſcending, if the workman ſhould, through inadvertency or careleſneſs, quit his hold whilſt the weight is raiſing. And by this means, the danger is prevented which might otherwiſe happen by the running down of the weight when left at liberty.

3 The third mechanical power or engine conſiſts either of one *moveable pulley*, or a *ſyſtem of pulleys*; ſome in a block or caſe which is fixed, and others in a block which is moveable, and riſes with the weight. For tho' a ſingle pulley, that only turns on its axis, and riſes not with the weight, may ſerve to change the direction of the power, yet it can give no mechanical advantage thereto; but is only as the beam of a balance, whoſe arms are of equal length and weight. Thus, if the equal weights W and P (fig. 7.) hang by the cord BB upon the pulley A, whoſe block *b* is fixed to the beam HI, they will counterpoiſe each other, juſt in the ſame manner as if the cord were cut in the middle. and its two ends hung upon the hooks fixt in the pulley at A and A, equally diſtant from its centre

But if a weight W hangs at the lower end of the moveable block *p* of the pulley D, and the cord GF goes under the pulley, it is plain that the half G of the cord bears one half of the weight W, and the half F the other; for they bear the whole between them. Therefore, whatever holds the upper end of either rope, ſuſtains one half of the weight; and if the cord at F be drawn up ſo as to raiſe the pulley D to C, the cord will then be extended to its whole length, all but that part which goes under the pulley: and conſequently, the power that draws the cord will have moved twice as far as the pulley D with its weight W riſes: on which account, a power whoſe intenſity is equal to one half of the weight will be able to ſupport it, becauſe if the power moves (by means of a ſmall addition) its velocity will be double the velocity of the weight; as may be ſeen by putting the cord over the fixt pulley C (which only changes the direction of the power, without giving any advantage to it) and hanging on the weight P, which is equal only to one half of the weight W; in which caſe there will be an equilibrium, and a little addition to P will cauſe it to deſcend, and raiſe W through a ſpace equal to one half of that through which P deſcends.—Hence, the advantage gained will be always equal to twice the number of pulleys in the moveable or undermoſt block. So that, when the upper or fixt block *u* contains two pulleys, which only turn on the axes, and the lower or moveable block U contains two pulleys, which not only turn upon their axes, but alſo riſe with the block and weight; the advantage gained by this is as 4 to the working power. Thus, if one end of the rope KMOQ be fixed to a hook at I, and the rope paſſes over the pulleys N and R, and under the pulleys L and P, and has a weight T, of one pound, hung to its other end at T, this weight will balance and ſupport a weight W of four pounds hanging by a hook at the moveable block U, allowing the ſaid block as a part of the weight. And if as much more power be added as is ſufficiennt to overcome the friction of the pulleys, the power will deſcend with four times as much velocity as the weight riſes, and conſequently through four times as much ſpace.

The two pulleys in the fixed block X, and the two in the moveable block Y, are in the ſame caſe with thoſe laſt mentioned; and thoſe in the lower block give the ſame advantage to the power.

As a ſyſtem of pulleys has not great weight and lies in a ſmall compaſs, it is eaſily carried about: and can be applied, in a great many caſes, for raiſing weights, where other engines cannot. But they have a great deal of friction, on three accounts: 1. Becauſe the diameters of their axes bear a very conſiderable proportion to their own diameters; 2. Becauſe in working they are apt to rub againſt one another, or againſt the ſides of the block; 3. Becauſe of the ſtiffneſs of the rope that goes over and under them.

4. The fourth mechanical power is the *inclined plane;* and the advantage gained by it is as great as its length exceeds its perpendicular height. Let AB (fig. 8.) be a plane parallel to the horizon, and CD a plane inclined to it; and ſuppoſe the whole length CD to be three times as great as the perpendicular height G*f*F: in this caſe, the cylinder E will be ſupported upon the plane CD, and kept

Plate CVII

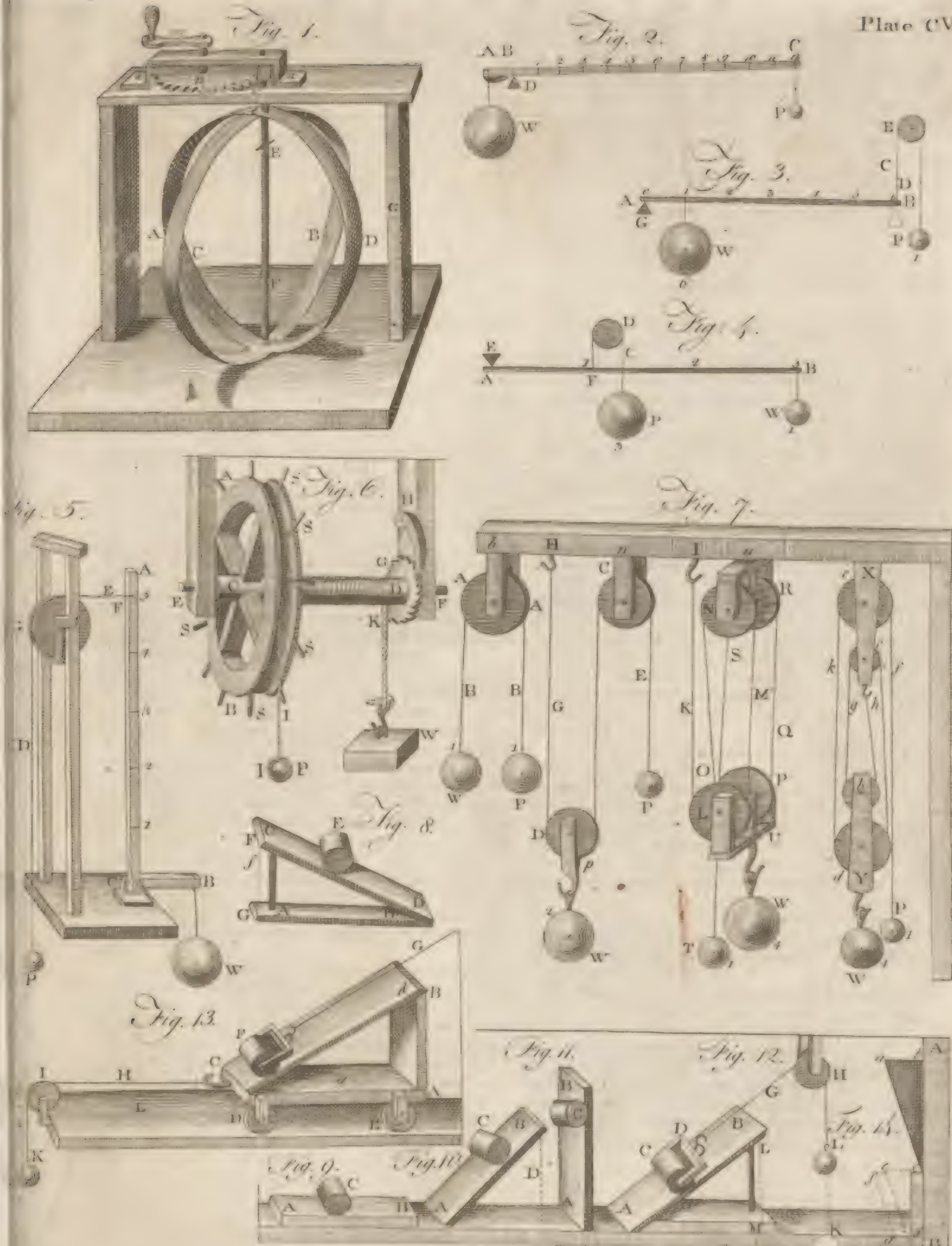


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
Fig. 13.
Fig. 14.

kept from rolling down upon it, by a power equal to a third part of the weight of the cylinder. Therefore, a weight may be rolled up this inclined plane with a third part of the power which would be ſufficient to draw it up by the ſide of an upright wall. If the plane was four times as long as high, a fourth part of the power would be ſufficient; and ſo on, in proportion. Or, if a pillar was to be raiſed from a floor to the height GF, by means of the engine ABDC, (which would then act as a half wedge, where the reſiſtance gives way only on one ſide) the engine and pillar would be in *equilibrio* when the power applied at GF was to the weight of the pillar as GF to GD; and if the power be increaſed, ſo as to overcome the friction of the engine againſt the floor and pillar, the engine will be driven, and the pillar raiſed: and when the engine has moved its whole length upon the floor, the pillar will be raiſed to the whole height of the engine, from G to F.

The force wherewith a rolling body deſcends upon an inclined plane, is to the force of its abſolute gravity, by which it would deſcend perpendicularly in a free ſpace, as the height of the plane is to its length. For, ſuppoſe the plane AB (fig. 9.) to be parallel to the horizon, the cylinder C will keep at reſt upon any part of the plane where it is laid. If the plane be ſo elevated, that its perpendicular height D (fig. 10.) is equal to half its length AB, the cylinder will roll down upon the plane with a force equal to half its weight; for it would require a power (acting on the direction of AB) equal to half its weight, to keep it from rolling. If the plane AB (fig. 11.) be elevated, ſo as to be perpendicular to the horizon, the cylinder C will deſcend with its whole force of gravity, becauſe the plane contributes nothing to its ſupport or hindrance; and therefore, it would require a power equal to its whole weight to keep it from deſcending.

Let the cylinder C (fig. 12.) be made to turn upon ſlender pivots in the frame D, in which there is a hook *e*, with a line G tied to it: let this line go over the fixed pulley H, and have its other end tied to a hook in the weight I. If the weight of the body I, be to the weight of the cylinder C, added to that of its frame D, as the perpendicular height of the plane LM is to its length AB, the weight will juſt ſupport the cylinder upon the plane, and a ſmall touch of a finger will either cauſe it to aſcend or deſcend with equal eaſe: then, if a little addition be made to the weight I, it will deſcend, and draw the cylinder up the plane. In the time that the cylinder moves from A to B, it will riſe through the whole height of the plane ML; and the weight will deſcend from H to K, through a ſpace equal to the whole length of the plane AB.

If the plane be made to move upon rollers or friction-wheels, and the cylinder be ſupported upon it; the ſame power will draw the plane under the cylinder, which before drew the cylinder up the plane, provided the pivots of the axes of the friction-wheels be ſmall, and the wheels themſelves be pretty large. For, let the machine ABC (fig. 13.) (equal in length and height to ABM, fig. 12.) be provided with four wheels, whereof two appear at D and E, and the third under C, whilſt the fourth is hid from ſight by the horizontal board *a*. Let the cylinder F be laid upon the lower end of the inclined plane CB, and the line G be extended from the frame of the cylinder, about ſix feet parallel to the plane CB; and, in that direction, fixed to a hook in the wall; which will ſupport the cylinder, and keep it from rolling off the plane. Let one end of the line H be tied to a hook at C in the machine, and the other end to a weight K, the ſame as drew the cylinder up the plane before. If this line be put over the fixed pully I, the weight K will draw the machine along the horizontal plane L, and under the cylinder F: and when the machine has been drawn the whole length CB, the cylinder will be raiſed to *d*, equal to the perpendicular height AB above the horizontal part at A.

To the inclined plane may be reduced all hatchets, chiſels, and other edge tools which are chamfred only on one ſide.

5. The fifth mechanical power or engine is the *wedge*, which may be conſidered as two equally inclined planes DEF and CEF, joined together at their baſes *e* EF: then DC (Plate CVIII. fig. 1.) is the whole thickneſs of the wedge at its back ABCD, where the power is applied; EF is the depth or height of the wedge; DF the length of one of its ſides, equal to CF the length of the other ſide; and OF is its ſharp edge, which is entered into the wood intended to be ſplit by the force of a hammer or mallet ſtriking perpendicularly on its back. Thus, AB*b* (fig. 2.) is a wedge driven into the cleft CDE of the wood FG.

When the wood does not cleave at any diſtance before the wedge, there will be an equilibrium between the power impelling the wedge downward, and the reſiſtance of the wood acting againſt the two ſides of the wedge; if the power be to the reſiſtance, as half the thickneſs of the wedge at its back is to the length of either of its ſides; that is, as A*a* to A*b*, or B*a* to B*b* (fig. 2.) And if the power be increaſed, ſo as to overcome the friction of the wedge and the reſiſtance ariſing from the coheſion or ſtickage of the wood, the wedge will be drove in, and the wood ſplit aſunder,

But, when the wood cleaves at any diſtance before the wedge (as it generally does) the power impelling the wedge will not be to the reſiſtance of the wood, as half the thickneſs of the wedge is to the length of one of its ſides; but as half its thickneſs is to the length of either ſide of the cleft, eſtimated from the top or acting part of the wedge. For, if we ſuppoſe the wedge to be lengthened down from *b* to the bottom of the cleft at E, the ſame proportion will hold; namely, that the power will be to the reſiſtance, as half the thickneſs of the wedge is to the length of either of its ſides: or, which amounts to the ſame thing, as the whole thickneſs of the wedge is to the length of both its ſides.

In order to prove what is here advanced concerning the wedge, let us ſuppoſe the wedge to be divided lengthwiſe into two equal parts: and then it will become two equally inclined planes; one of which, as *abc*, (Plate CVII. fig. 14.) may be made uſe of as a half wedge for ſeparating the moulding *cd* from the wainſcot AB. It is evident, that when this half-wedge has been driven its whole length *ac* between the wainſcot and moulding, its ſide *ac* will be at *ed*; and the moulding will be ſeparated

to *fg* from the wainſcot. Now, from what has been already proved of the inclined plane, it appears, that to have an equilibrium between the power impelling the half-wedge and the reſiſtance of the moulding, the former muſt be to the latter as *ab* to *ac;* that is, as the thickneſs of the back which receives the ſtroke is to the length of the ſide againſt which the moulding acts. Therefore, ſince the power upon the half wedge is to the reſiſtance againſt its ſide, as the half back *ab* is to the whole ſide *ac*, it is plain, that the power upon the whole wedge (where the whole back is double the half back) muſt be to the reſiſtance againſt both its ſides, as the thickneſs of the whole back is to the length of both the ſides, ſuppoſing the wedge at the bottom of the cleft; or as the thickneſs of the whole back to the length of both ſides of the cleft, when the wood ſplits at any diſtance before the wedge. For, when the wedge is driven quite into the wood, and the wood ſplits at ever ſo ſmall a diſtance before its edge, the top of the wedge then becomes the acting part, becauſe the wood does not touch it any where elſe. And ſince the bottom of the cleft muſt be conſidered as that part where the whole ſtickage or reſiſtance is accumulated, it is plain, from the nature of the lever, that the farther the power acts from the reſiſtance, the greater is the advantage.

Some writers have advanced, that the power of the wedge is to the reſiſtance to be overcome, as the thickneſs of the back of the wedge is to the length only of one of its ſides; which ſeems very ſtrange: for, if we ſuppoſe AB (Plate CVIII. fig 3.) to be a ſtrong inflexible bar of wood or iron fixt into the ground at CB, and D and E to be two blocks of marble lying on the ground on oppoſite ſides of the bar, it is evident that the block D may be ſeparated from the bar to the diſtance *d*, equal to *ab*, by driving the inclined plane or half wedge *abo* down between them; and the block E may be ſeparated to an equal diſtance on the other ſide, in like manner, by the half wedge *cdo*. But the power impelling each half wedge will be to the reſiſtance of the block againſt its ſide, as the thickneſs of that half wedge is to the length of its acting ſide. Therefore the power to drive both the half wedges is to both the reſiſtances, as both the half backs is to the length of both the acting ſides, or as half the thickneſs of the whole back is to the length of either ſide. And, if the bar be taken away, the blocks put cloſe together, and the two half wedges joined to make one; it will require as much force to drive it down between the blocks, as is equal to the ſum of the ſeparate powers acting upon the half wedges when the bar was between them.

To confirm this by an experiment, let two cylinders, as AB (fig. 4.) and CD, be drawn towards one another by lines running over fixed pulleys, and a weight of 40 ounces hanging at the lines belonging to each cylinder: and let a wedge of 40 ounces weight, having its back juſt as thick as either of its ſides is long, be put between the cylinders, which will then act againſt each ſide with a reſiſtance equal to 40 ounces, whilſt its own weight endeavours to bring it down and ſeparate them. And here, the power of the wedge's gravity impelling it downward, will be to the reſiſtance of both the cylinders againſt the wedge, as the thickneſs of the wedge is to the length of both its ſides; for there will then be an equilibrium between the weight of the wedge and the reſiſtance of the cylinders againſt it, and it will remain at any height between them; requiring juſt as much power to puſh it upward as to pull it downward.—If another wedge of equal weight and depth with this, and only half as thick, be put between the cylinders, it will require twice as much weight to be hung at the ends of the lines which draw them together, to keep the wedge from going down between them. That is, a wedge of 40 ounces, whoſe back is only equal to half the length of one of its ſides, will require 80 ounces to each cylinder, to keep it in an equilibrium between them: and twice 80 is 160, equal to four times 40. So that the power will be always to the reſiſtance, as the thickneſs of the back of the wedge is to the length (not of its one ſide, but) of both its ſides.

The beſt way, though perhaps not the neateſt, for making a wedge with its appurtenances for ſuch experiments, is as follows. Let IKLM (fig. 4.) and LMNO be two flat pieces of wood, each about fifteen inches long and three or four in breadth, joined together by a hinge at LM; and let P be a graduated arch of braſs, on which the ſaid pieces of wood may be opened to any angle not more than 60 degrees, and then fixt at the given angle by means of the two ſcrews *a* and *b*. Then, IKNO will repreſent the back of the wedge, LM its ſharp edge which enters the wood, and the outſides of the pieces IKLM and LMNO the two ſides of the wedge againſt which the wood acts in cleaving. By means of the ſaid arch, the wedge may be opened ſo as to adjuſt the thickneſs of its back in any proportion to the length of either of its ſides, but not to exceed that length: and any weight, as *p*, may be hung to the wedge upon the hook M, which weight, together with the weight of the wedge itſelf, may be conſidered as the impelling power; which is all the ſame in experiment, whether it be laid upon the back of the wedge to puſh it down, or hung to its edge to pull it down. —Let AB and CD be two wooden cylinders, each about two inches thick, where they touch the outſides of the wedge; and let their ends be made like two round flat plates, to keep the wedge from ſlipping off endwiſe between them. Let a ſmall cord with a loop on one end of it go over a pivot in the end of each cylinder, and the cords S and T belonging to the cylinder AB go over the fixt pulleys W and X, and be faſtened at their other ends to the bar *wx*, on which any weight, as Z, may be hung at pleaſure. In like manner, let the cords Q and R belonging to the cylinder BC go over the fixt pulleys U and V to the bar *uv*, on which a weight Y equal to Z may be hung. Theſe weights, by drawing the cylinders towards one another, may be conſidered as the reſiſtance of the wood acting equally againſt oppoſite ſides of the wedge; the cylinders themſelves being ſuſpended near and parallel to each other, by their pivots in loops on the lines E,F,G,H; which lines may be fixed to hooks in the cieling of the room. The longer theſe lines are, the better; and they ſhould never be leſs than four feet each. The further alſo the pulleys W,V and W,X are from the cylinders, the truer will the experiments be; and they may turn upon pins fixed into the wall.

In this machine, the weights Y and Z, and the weight *p*, may be varied at pleaſure, ſo as to be adjuſted in proportion

portion of the length of the wedge's ſide to the thickneſs of its back; and when they are ſo adjuſted, the wedge will be in *equilibrio* with the reſiſtance of the cylinders.

The wedge is a very great mechanical power, ſince not only wood but even rocks can be ſplit by it; which would be impoſſible to effect by the lever, wheel and axle, or pulley: for the force of the blow, or ſtroke, ſhakes the cohering parts, and thereby makes them ſeparate the more eaſily.

6. The ſixth and laſt mechanical power is the *ſcrew;* which cannot properly be called a ſimple machine, becauſe it is never uſed without the application of a lever or winch to aſſiſt in turning it: and then it becomes a compound engine of a very great force either in preſſing the parts of bodies cloſe together, or in raiſing great weights. It may be conceived to be made by cutting a piece of paper ABC (fig. 5) into the form of an inclined plane or half wedge, and then coiling it round a cylinder AB (fig. 6.) And here it is evident, that the winch E muſt turn the cylinder once round before the weight or reſiſtance D can be moved from one ſpiral winding to another, as from *d* to *c:* therefore, as much as the circumference of a circle deſcribed by the handle of the winch is greater than the interval or diſtance between the ſpirals, ſo much is the force of the ſcrew. Thus, ſuppoſing the diſtance between the ſpirals to be half an inch, and the length of the winch to be twelve inches; the circle deſcribed by the handle of the winch where the power acts will be 76 inches nearly, or about 152 half inches, and conſequently 152 times as great as the diſtance between the ſpirals: and therefore, a power at the handle, whoſe intenſity is equal to no more than a ſingle pound, will balance 152 pounds acting againſt the ſcrew; and as much additional force, as is ſufficient to overcome the friction, will raiſe the 152 pounds; and the velocity of the power will be to the velocity of the weight, as 152 to 1. Hence it appears, that the longer the winch be made, and the nearer the ſpirals are to one another, ſo much the greater is the force of the ſcrew.

A machine for ſhewing the force or power of the ſcrew may be contrived in the following manner. Let the wheel C (fig. 7.) have a ſcrew *ab* on its axis, working in the teeth of the wheel D, which ſuppoſe to be 48 in number. It is plain, that for every time the wheel C and ſcrew *ab* are turned round by the winch A, the wheel D will be moved one tooth by the ſcrew; and therefore, in 48 revolutions of the winch, the wheel D will be turned once round. Then, if the circumference of a circle deſcribed by the handle of the winch be equal to the circumference of a groove *e* round the wheel D, the velocity of the handle will be 48 times as great as the velocity of any given point in the groove. Conſequently; if a line G (above number 48) goes round the groove *e*, and has a weight of 48 pounds hung to it below the pedeſtal EF, a power equal to one pound at the handle will balance and ſupport the weight. To prove this by experiment, let the circumferences of the grooves of the wheels C and D be equal to one another; and then if a weight H of one pound be ſuſpended by a line going round the groove of the wheel C, it will balance a weight of 48 pounds hanging by the line G; and a ſmall addition to the weight H will cauſe it to deſcend, and ſo raiſe up the other weight.

If the line G, inſtead of going round the groove *e* of the wheel D, goes round its axle I; the power of the machine will be as much increaſed, as the circumference of the groove *e* exceeds the circumference of the axle: which, ſuppoſing it to be ſix times, then one pound at H will balance 6 times 48, or 288 pounds hung to the line on the axle: and hence the power or advantage of this machine will be as 288 to 1. That is to ſay, a man, who by his natural ſtrength could lift an hundred weight, will be able to raiſe 288 hundred, or $14\frac{8}{20}$ ton weight by this engine.

But the following engine is ſtill more powerful, on account of its having the addition of four pulleys: and in it we may look upon all the mechanical powers combined together, even if we take in the balance. For as the axis D (fig. 8.) of the bar AB is in its middle at C, it is plain that if equal weights are ſuſpended upon any two pins equidiſtant from the axis C, they will counterpoiſe each other.—It becomes a lever by hanging a ſmall weight P upon the pin *n*, and a weight as much heavier upon either of the pins *b*, *c*, *d*, *e*, or *f*, as is in proportion to the pins being ſo much nearer the axis. The wheel and axle FG is evident; ſo is the ſcrew E, which takes in the inclined plane, and with it the half wedge. Part of a cord goes round the axle, the reſt under the lower pulleys K, *m*, over the upper pulleys L, *n*, and then it is tied to a hook at *m* in the lower or moveable block, on which hangs the weight W.

In this machine, if the wheel F has 30 teeth, it will be turned once round in thirty revolutions of the bar AB, which is fixt on the axis D of the ſcrew E: if the length of the bar is equal to twice the diameter of the wheel, the pins *a* and *n* at the ends of the bar will move 60 times as faſt as the teeth of the wheel do: and conſequently, one ounce at P will balance 60 ounces hung upon a tooth at *q* in the horizontal diameter of the wheel. Then, if the diameter of the wheel F is 10 times as great as the diameter of the axle G, the wheel will have 10 times the velocity of the axle; and therefore one ounce P at the end of the lever AC will balance 10 times 60 or 6000 ounces hung to the rope H which goes round the axle. Laſtly, if four pulleys be added, they will make the velocity of the lower block K, and weight W, four times leſs than the velocity of the axle: and this being the laſt power in the machine, which is four times as great as that gained by the axle, it makes the whole power of the machine 4 times 600, or 2400. So that a man who could lift one hundred weight in his arms, by his natural ſtrength, would be able to raiſe 2400 hundred weight by this engine.—But it is here as in all other mechanical caſes; for the time loſt is always as much as the power gained, becauſe the velocity with which the power moves will ever exceed the velocity with which the weight riſes, as much as the intenſity of the weight exceeds the intenſity of the power.

The friction of the ſcrew itſelf is very conſiderable; and there are few compound engines, but what, upon account of the friction of the parts againſt one another, will

will require a third part of more power to work them when loaded, than what is ſufficient to conſtitute a balance between the weight and the power.

Of Mills, Cranes, Wheel-carriages, and the Engine for driving Piles.

As theſe machines are ſo univerſally uſeful, it would be ridiculous to make any apology for deſcribing them.

In a common *breaſt-mill*, where the fall of water may be about ten feet, AA (Plate CVIII. fig. 9.) is the great wheel, which is generally about 17 or 18 feet in diameter, reckoned from the outermoſt edge of any float-board at *a* to that of its oppoſite float at *b*. To this wheel the water is conveyed through a channel; and ſo, falling upon the wheel, turns it round.

On the axis BB of this wheel, and within the mill-houſe, is a wheel D, about 8 or 9 feet diameter, having 61 cogs, which turn a trundle E containing ten upright ſtaves or rounds; and when theſe are the number of cogs and rounds, the trundle will make $6\frac{1}{10}$ revolutions for one revolution of the wheel.

The trundle is fixt upon a ſtrong iron axis called the ſpindle, the lower end of which turns in a braſs foot, fixt at F, in the horizontal beam ST called the bridge-tree; and the upper part of the ſpindle turns in a wooden buſh fixt into the nether millſtone which lies upon beams in the floor YY. The top part of the ſpindle above the buſh is ſquare, and goes into a ſquare hole in a ſtrong iron croſs *abcd* (ſee fig. 3.) called the rynd; under which, and cloſe to the buſh, is a round piece of thick leather upon the ſpindle, which it turns round at the ſame time as it does the rynd.

The rynd is let into grooves in the under ſurface of the running millſtone G (fig. 2.) and ſo turns it round in the ſame time that the trundle E is turned round by the cog-wheel D. This millſtone has a large hole quite through its middle, called the eye of the ſtone, through which the middle part of the rynd and upper end of the ſpindle may be ſeen; whilſt the four ends of the rynd lie hid below the ſtone in their grooves.

The end T of the bridge-tree TS (which ſupports the upper millſtone G upon the ſpindle) is fixed into a hole in the wall; and the end S is let into a beam QR called the brayer, whoſe end R remains fixt in a mortiſe; and its other end Q hangs by a ſtrong iron rod P which goes through the floor YY, and has a ſcrew-nut on its top at O; by the turning of which nut, the end Q of the brayer is raiſed or depreſſed at pleaſure, and conſequently the bridge-tree TS and upper millſtone. By this means, the upper millſtone may be ſet as cloſe to the under one, or raiſed as high from it, as the miller pleaſes. The nearer the millſtones are to one another, the finer they grind the corn; and the more remote from one another, the coarſer.

The upper millſtone G is incloſed in a round box H, which does not touch it any where; and is about an inch diſtant from its edge all around. On the top of this box ſtands a frame for holding the hopper *kk*, to which is hung the ſhoe I by two lines faſtened to the hind-part of it, fixed upon hooks in the hopper, and by one end of the crook-ſtring K faſtened to the fore-part of it at *i*; the other end being twiſted round the pin L. As the pin is turned one way, the ſtring draws up the ſhoe cloſer to the hopper, and ſo leſſens the aperture between them; and as the pin is turned the other way, it lets down the ſhoe, and enlarges the aperture.

If the ſhoe be drawn up quite to the hopper, no corn can fall from the hopper into the mill; if it be let a little down, ſome will fall: and the quantity will be more or leſs, according as the ſhoe is more or leſs let down. For the hopper is open at bottom, and there is a hole in the bottom of the ſhoe, not directly under the bottom of the hopper, but forwarder towards the end *i*, over the middle of the eye of the millſtone.

There is a ſquare hole in the top of the ſpindle, in which is put the feeder *e* (fig. 10.) This feeder (as the ſpindle turns round) jogs the ſhoe three times in each revolution, and ſo cauſes the corn to run conſtantly down from the hopper, through the ſhoe, into the eye of the millſtone, where it falls upon the top of the rynd, and is, by the motion of the rynd and the leather under it, thrown below the upper ſtone, and ground between it and the lower one. The violent motion of the ſtone creates a centrifugal force in the corn going round with it, by which means it gets farther and farther from the centre, as in a ſpiral, in every revolution, until it be thrown quite out; and, being then ground, it falls through a ſpout M, called the mill-eye, into the trough N.

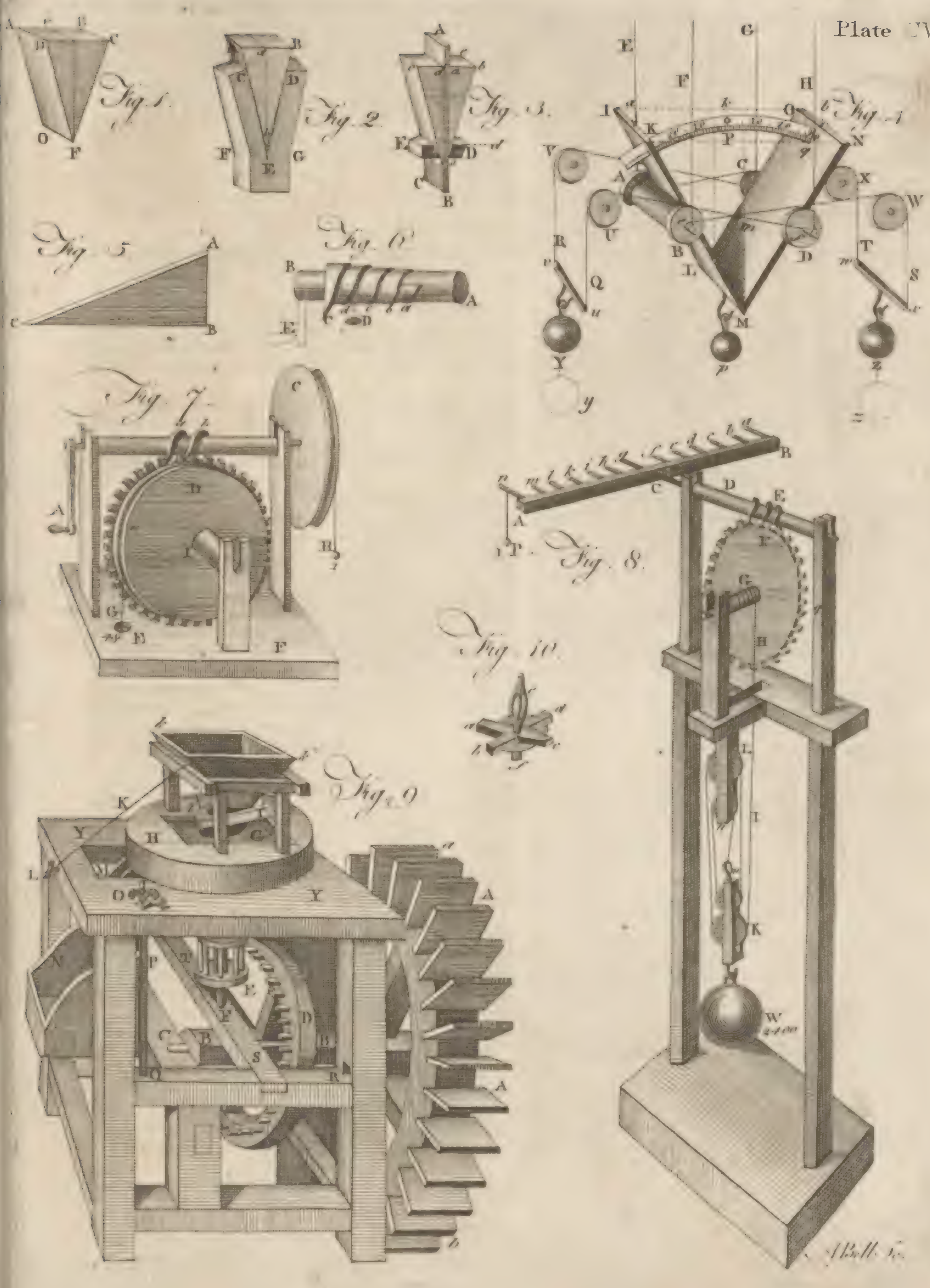
When the mill is fed too faſt, the corn bears up the ſtone, and is ground too coarſe; and beſides, it clogs the mill ſo as to make it go too ſlow. When the mill is too ſlowly fed, it goes too faſt, and the ſtones by their attrition are apt to ſtrike fire againſt one another. Both which inconveniencies are avoided by turning the pin L backwards or forwards, which draws up or lets down the ſhoe; and ſo regulates the feeding as the miller ſees convenient.

The heavier the running millſtone is, and the greater the quantity of water that falls upon the wheel, ſo much the faſter will the mill bear to be fed; and conſequently ſo much the more it will grind. And on the contrary, the lighter the ſtone, and the leſs the quantity of water, ſo much ſlower muſt the feeding be. But when the ſtone is conſiderably wore, and become light, the mill muſt be fed ſlowly at any rate; otherwiſe the ſtone will be too much borne up by the corn under it, which will make the meal coarſe.

The quantity of power required to turn a heavy millſtone is but a very little more than what is ſufficient to turn a light one: for as it is ſupported upon the ſpindle by the bridge-tree ST, and the end of the ſpindle that turns in the braſs foot therein being but ſmall, the odds ariſing from the weight is but very inconſiderable in its action againſt the power or force of the water. And beſides, a heavy ſtone has the ſame advantage as a heavy fly; namely, that it regulates the motion much better than a light one.

In order to cut and grind the corn, both the upper and under millſtones have channels or furrows cut into them, proceeding obliquely from the centre towards the circumference. And theſe furrows are each cut perpendicularly on one ſide and obliquely on the other into the ſtone, which

Plate CVIII



which gives each furrow a ſharp edge, and in the two ſtones they come, as it were, againſt one another like the edges of a pair of ſciſſars: and ſo cut the corn, to make it grind the eaſier when it falls upon the places between the furrows. Theſe are cut the ſame way in both ſtones when they lie upon their backs, which makes them run croſs ways to each other when the upper ſtone is inverted by turning its furrowed ſurface towards that of the lower. For, if the furrows of both ſtones lay the ſame way, a great deal of the corn would be driven onward in the lower furrows, and ſo come out from between the ſtones without ever being cut.

When the furrows became blunt and ſhallow by wearing, the running ſtone muſt be taken up, and both ſtones new dreſt with a chiſel and hammer. And every time the ſtone is taken up, there muſt be ſome tallow put round the ſpindle upon the buſh, which will ſoon be melted by the heat that the ſpindle acquires from its turning and rubbing againſt the buſh, and ſo will get in betwixt them: otherwiſe the buſh would take fire in a very little time.

The buſh muſt embrace the ſpindle quite cloſe, to prevent any ſhake in the motion; which would make ſome parts of the ſtones grate and fire againſt each other; whilſt other parts of them would be too far aſunder, and by that means ſpoil the meal in grinding.

Whenever the ſpindle wears the buſh ſo as to begin to ſhake in it, the ſtone muſt be taken up, and a chiſel drove into ſeveral parts of the buſh; and when it is taken out, wooden wedges muſt be driven into the holes; by which means the buſh will be made to embrace the ſpindle cloſe all around it again. In doing this, great care muſt be taken to drive equal wedges into the buſh on oppoſite ſides of the ſpindle; otherwiſe it will be thrown out of the perpendicular, and ſo hinder the upper ſtone from being ſet parallel to the under one, which is abſolutely neceſſary for making good work. When any accident of this kind happens, the perpendicular poſition of the ſpindle muſt be reſtored by adjuſting the bridge-tree ST by proper wedges put between it and the brayer QR.

It often happens, that the rynd is a little wrenched in laying down the upper ſtone upon it; or is made to ſink a little lower upon one ſide of the ſpindle than on the other; and this will cauſe one edge of the upper ſtone to drag all around upon the other, whilſt the oppoſite edge will not touch. But this is eaſily ſet to rights, by raiſing the ſtone a little with a lever, and putting bits of paper, cards, or thin chips, betwixt the rynd and the ſtone.

The diameter of the upper ſtone is generally about ſix feet, the lower ſtone about an inch more: and the upper ſtone when new contains about $22\frac{1}{2}$ cubic feet, which weighs ſomewhat more than 1900 pounds. A ſtone of this diameter ought never to go more than 60 times round in a minute; for if it turns faſter, it will heat the meal.

The grinding ſurface of the under ſtone is a little convex from the edge to the centre, and that of the upper ſtone a little more concave: ſo that they are fartheſt from one another in the middle, and come gradually nearer towards the edges. By this means, the corn at its firſt entrance between the ſtones is only bruiſed; but as it goes farther on towards the circumference or edge, it is cut ſmaller and ſmaller; and at laſt finely ground juſt before it comes out from between them.

The water-wheel muſt not be too large, for if it be, its motion will be too ſlow; nor too little, for then it will want power. And for a mill to be in perfection, the floats of the wheel ought to move with a third part of the velocity of the water, and the ſtone to turn round once in a ſecond of time.

Such a mill as this, with a fall of water about $7\frac{1}{2}$ feet, will require about 32 hogſheads every minute to turn the wheel with a third part of the velocity with which the water falls, and to overcome the reſiſtance ariſing from the friction of the geers and attrition of the ſtones in grinding the corn.

The greater fall the water has, the leſs quantity of it will ſerve to turn the mill. The water is kept up in the mill-dam, and let out by a ſluice called the penſtock, when the mill is to go. When the penſtock is drawn up by means of a lever, it opens a paſſage through which the water flows to the wheel; and when the mill is to be ſtopt, the penſtock is let down, which ſtops the water from falling upon the wheel.

A leſs quantity of water will turn an overſhot-mill (where the wheel has buckets inſtead of float-boards) than a breaſt-mill where the fall of the water ſeldom exceeds half the height A*b* of the wheel. So that, where there is but a ſmall quantity of water, and a fall great enough for the wheel to lie under it, the bucket (or overſhot) wheel is always uſed. But where there is a large body of water, with a little fall, the breaſt or float-board wheel muſt take place. Where the water runs only upon a little declivity, it can act but ſlowly upon the under part of the wheel at *b*; in which caſe the motion of the wheel will be very ſlow: and therefore, the floats ought to be very long, though not high, that a large body of water may act upon them; ſo that what is wanting in velocity may be made up in power; and then the cog-wheel may have a greater number of cogs in proportion to the rounds in the trundle, in order to give the millſtone a ſufficient degree of velocity.

They who have read what is ſaid in the firſt ſection, concerning the acceleration of bodies falling freely by the power of gravity acting conſtantly and uniformly upon them, may perhaps aſk, Why ſhould the motion of the wheel be equable, and not accelerated, ſince the water acts conſtantly and uniformly upon it? The plain anſwer is, That the velocity of the wheel can never be ſo great as the velocity of the water that turns it; for, if it ſhould become ſo great, the power of the water would be quite loſt upon the wheel, and then there would be no proper force to overcome the friction of the geers and attrition of the ſtones. Therefore, the velocity with which the wheel begins to move, will increaſe no longer than till its *momentum* or force is balanced by the reſiſtance of the machine; and then the wheel will go on with an equable motion.

[If the cog-wheel D be made about 18 inches diameter, with 30 cogs, the trundle as ſmall in proportion with 10 ſtaves, and the milſtones be each about two feet in diameter, and the whole work be put into a ſtrong frame of wood,

as

as represented in the figure, the engine will be a hand-mill for grinding corn or malt in private families. And then, it may be turned by a winch, instead of the wheel AA; the millstone making three revolutions for every one of the winch. If a heavy fly be put upon the axle B, near the winch, it will help to regulate the motion.]

If the cogs of the wheel and rounds of the trundle could be put in as exactly as the teeth are cut in the wheels and pinions of a clock, then the trundle might divide the wheel exactly; that is to say, the trundle might make a given number of revolutions for one of the wheel, without a fraction. But as any exact number is not necessary in mill-work, and the cogs and rounds cannot be set in so truly as to make all the intervals between them equal; a skilful mill-wright will always give the wheel what he calls *a hunting cog*; that is, one more than what will answer to an exact division of the wheel by the trundle. And then, as every cog comes to the trundle, it will take the next staff or round behind the one which it took in the former revolution: and by that means, will wear all the parts of the cogs and rounds which work upon one another equally, and to equal distances from one another in a little time; and so make a true uniform motion throughout the whole work. Thus, in the above water-mill, the trundle has 10 staves, and the wheel 61 cogs.

Sometimes, where there is a sufficient quantity of water, the cog-wheel AA (Plate CIX. fig. 1.) turns a large trundle BB, on whose axis C is fixed the horizontal wheel D, with cogs all round its edge, turning two trundles E and F at the same time; whose axes or spindles G and H turn two millstones I and K, upon the fixed stones L and M. And when there is not work for them both, either may be made to lie quiet, by taking out one of the staves of its trundle, and turning the vacant place towards the cog-wheel D. And there may be a wheel fixt on the upper end of the great upright axle C for turning a couple of boulting-mills, and other work for drawing up the sacks, fanning and cleaning the corn, sharpening of tools, &c.

If, instead of the cog-wheel AA and trundle BB, horizontal levers be fixed into the axle C, below the wheel D; then, horses may be put to these levers for turning the mill; which is often done where water cannot be had for that purpose.

The working parts of a wind-mill differ very little from those of a water mill; only the former is turned by the action of the wind upon four sails, every one of which ought (as is generally believed) to make an angle of $54\frac{3}{4}$ degrees with a plane perpendicular to the axis on which the arms are fixt for carrying them; it being demonstrable, that when the sails are set to such an angle, and the axis turned end-ways toward the wind, the wind has the greatest power upon the sails. But this angle answers only to the case of a vane or sail just beginning to move: for, when the vane has a certain degree of motion, it yields to the wind; and then that angle must be increased to give the wind its full effect.

Again, the increase of this angle should be different, according to the different velocities from the axis to the extremity of the vane. At the axis it should be $54\frac{3}{4}$ degrees, and thence continually increase, giving the vane a twist, and so causing all the ribs of the vane to lie in different planes.

Lastly, these ribs ought to decrease in length from the axis to the extremity, giving the vane a curvilineal form; so that no part of the force of any one rib be spent upon the rest, but all move on independent of each other. All this is required to give the sails of a wind-mill their true form: and we see both the twist and the diminution of the ribs exemplified in the wings of birds.

It is almost incredible to think with what velocity the tips of the sails move when acted upon by a moderate gale of wind. We have several times counted the number of revolutions made by the sails in ten or fifteen minutes; and from the length of the arms from tip to tip, have computed, that if a hoop of that diameter was to run upon the ground with the same velocity that it would move if put upon the sail-arms, it would go upwards of 30 miles in an hour.

As the ends of the sails nearest the axis cannot move with the same velocity that the tips or farthest ends do, although the winds act equally strong upon them; perhaps a better position than that of stretching them along the arms directly from the centre of motion, might be to have them set perpendicularly across the farther ends of the arms, and there adjusted lengthwise to the proper angle. For, in that case, both ends of the sails would move with the same velocity; and being farther from the centre of motion, they would have so much the more power: and then, there would be no occasion for having them so large as they are generally made, which would render them lighter, and consequently there would be so much the less friction on the thick neck of the axle where it turns in the wall.

A *crane* is an engine by which great weights are raised to certain heights, or let down to certain depths. It consists of wheels, axles, pulleys, ropes, and a gib or gibbet. When the rope H (fig. 2.) is hooked to the weight K, a man turns the winch A, on the axis whereof is the trundle B, which turns the wheel C, on whose axis D is the trundle E, which turns the wheel F with its upright axis G, on which the great rope HH winds as the wheel turns; and going over a pulley I at the end of the arm *d* of the gib *ccde*, it draws up the heavy burden K, which being raised to a proper height, as from a ship to the quay, is then brought over the quay by pulling the wheel Z round by the handles *z,z*, which turns the gib by means of the half wheel *b* fixt on the gib-post *cc*, and the strong pinion *a* fixt on the axis of the wheel Z. This wheel gives the man that turns it an absolute command over the gib, so as to prevent it from taking any unlucky swing, such as often happens when it is only guided by a rope tied to its arm *d*; and people are frequently hurt, sometimes killed, by such accidents.

The great rope goes between two upright upright rollers *i* and *k*, which turn upon gudgeons in the fixed beams *f* and *g*: and as the gib is turned towards either side, the rope bends upon the roller next that side. Were it not for these rollers, the gib would be quite unmanageable; for the moment it were turned ever so little towards any side, the weight K would begin to descend, because the rope would be shortened between the pulley

I and axis G; and ſo the gib would be pulled violently to that ſide, and either be broken to pieces, or break every thing that came in its way. Theſe rollers muſt be placed ſo, that the ſides of them, round which the rope bends, may keep the middle of the bended part directly even with the centre of the hole in which the upper gudgeon of the gib turns in the beam *f*. The truer theſe rollers are placed, the eaſier the gib is managed, and the leſs apt to ſwing either way by the force of the weight K.

A ratchet-wheel Q is fixt upon the axis D, near the trundle E; and unto this wheel falls the catch or click R. This hinders the machine from running back by the weight of the burden K, if the man who raiſes it ſhould happen to be careleſs, and ſo leave off working at the winch A ſooner than he ought to do.

When the burden K is raiſed to its proper height from the ſhip, and brought over the quay by turning the gib about, it is let down gently upon the quay, or into a cart ſtanding thereon, in the following manner: A man takes hold of the rope *tt* (which goes over the pulley *v*, and is tied to a hook at S in the catch R) and ſo diſengages the catch from the ratchet-wheel Q; and then, the man at the winch A turns it backward, and lets down the weight K. But if the weight pulls too hard againſt this man, another lays hold of the handle V, and by pulling it downward, draws the gripe U cloſe to the wheel Y, which, by rubbing hard againſt the gripe, hinders the too quick deſcent of the weight; and not only ſo, but even ſtops it at any time, if required. By this means, heavy goods may be either raiſed or let down at pleaſure, without any danger of hurting the men who work the engine.

When part of the goods are craned up, and the rope is to be let down for more, the catch R is firſt diſengaged from the ratchet-wheel Q, by pulling the cord *t*; then the handle *q* is turned half round backward, which, by the crank *nn* in the piece *o*, pulls down the frame *h* between the guides *m* and *m* (in which it ſlides in a groove) and ſo diſengages the trundle B from the wheel C: and then, the heavy hook β at the end of the rope H deſcends by its own weight, and turns back the great wheel F with its trundle E, and the wheel C; and this laſt wheel acts like a fly againſt the wheel E and hook β, and ſo hinders it from going down too quick; whilſt the weight X keeps up the gripe U from rubbing againſt the wheel Y, by means of a cord going from the weight, over the pulley *w* to the hook W in the gripe; ſo that the gripe never touches the wheel, unleſs it be pulled down by the handle V.

When the crane is to be ſet at work again, for drawing up another burden, the handle *q* is turned half round forewards: which, by the crank *nn*, raiſes up the frame *h*, and cauſes the trundle B to lay hold of the wheel C; and then, by turning the winch A, the burden of goods K is drawn up as before.

The crank *nn* turns pretty ſtiff in the mortiſe near *o*, and ſtops againſt the farther end of it when it has got juſt a little beyond the perpendicular; ſo that it can never come back of itſelf: and therefore the trundle B can never come away from the wheel C, until the handle *q* be turned half round.

The great rope runs upon rollers in the lever LM, which keep it from bending between the axle at G and the pulley I. This lever turns upon the axis N by means of the weight O, which is juſt ſufficient to keep its end L up to the rope; ſo that, as the great axle turns, and the rope coils round it, the lever riſes with the rope, and prevents the coilings from going over one another.

The power of this crane may be eſtimated thus: Suppoſe the trundle B to have 13 ſtaves or rounds, and the wheel C to have 78 ſpur cogs; the trundle E to have 14 ſtaves, and the wheel F 56 cogs: then, by multiplying the ſtaves of the trundles, 13 and 14, into one another, their product will be 182; and by multiplying the cogs of the wheels, 78 and 56, into one another, their product will be 4368; and dividing 4368 by 182, the quotient will be 24; which ſhews that the winch A makes 24 turns for one turn of the wheel F and its axle G on which the great rope or chain HIH winds. So that, if the length or radius of the winch A were only equal to half the diameter of the great axle G, added to half the thickneſs of the rope H, the power of the crane would be as 24 to 1: but the radius of the winch being double the above length, it doubles the ſaid power, and ſo makes it as 48 to 1: in which caſe a man may raiſe 48 times as much weight by this engine as he could do by his natural ſtrength without it, making proper allowance for the friction of the working parts. —Two men may work at once, by having another winch on the oppoſite end of the axis of the trundle under B; and ſo make the power ſtill double.

If this power be thought greater than what may be generally wanted, the wheels may be made with fewer cogs in proportion to the ſtaves in the trundles: and ſo the power may be of whatever degree is judged to be requiſite. But if the weight be ſo great as will require yet more power to raiſe it (ſuppoſe a double quantity) then the rope H may be put under a moveable pulley, as δ, and the end of it tied to a hook in the gib at ε; which will give a double power to the machine, and ſo raiſe a double weight hooked to the block of the moveable pulley.

When only ſmall burdens are to be raiſed, this may be quickly done by men puſhing the axle G round by the hand-ſpokes *y,y y,y*; having firſt diſengaged the trundle B from the wheel C: and then, this wheel will only act as a fly upon the wheel F; and the catch R will prevent its running back, if the men ſhould inadvertently leave off puſhing before the burden be unhooked from β.

Laſtly, when very heavy burdens are to be raiſed, which might endanger the breaking of the cogs in the wheel F; their force againſt theſe cogs may be much abated by men puſhing round the hand-ſpokes *y,y,y,y*, whilſt the man at A turns the winch.

We have only ſhewn the working parts of this crane, without the whole of the beams which ſupport them; knowing that theſe are eaſily ſuppoſed, and that if they had been drawn, they would have hid a great deal of the working parts from ſight, and alſo confuſed the figure.

Another very good *crane* is made in the following manner. AA (fig 3.) is a great wheel turned by men walking within it at H. On the part C, of its axle BC, the great rope D is wound as the wheel turns; and this

rope draws up goods in the ſame way as the rope HH does in the above-mentioned crane, the gib-work here being ſuppoſed to be of the ſame ſort. But theſe cranes are very dangerous to the men in the wheel; for, if any of the men ſhould chance to fall, the burden will make the wheel run back and throw them all about within it; which often breaks their limbs, and ſometimes kills them. The late ingenious Mr *Padmore* of Briſtol, whoſe contrivance the forementioned crane is, obſerving this dangerous conſtruction, contrived a method for remedying it, by putting cogs all around the outſide of the wheel, and applying a trundle E to turn it; which increaſes the power as much as the number of cogs in the wheel is greater than the number of ſtaves in the trundle: and by putting a ratchet-wheel F on the axis of the trundle, (as in the above-mentioned crane, with a catch to fall into it, the great wheel is ſtopt from running back by the force of the weight, even if all the men in it ſhould leave off walking. And by one man working at the winch I, or two men at the oppoſite winches when needful, the men in the wheel are much aſſiſted, and much greater weights are raiſed, than could be by men only within the wheel. Mr. *Padmore* put alſo a gripe-wheel G upon the axis of the trundle, which being pinched in the ſame manner as deſcribed in the former crane, heavy burdens may be let down without the leaſt danger. And before this contrivance, the lowering of goods was always attended with the utmoſt danger to the men in the wheel; as every one muſt be ſenſible of, who has ſeen ſuch engines at work.

And it is ſurpriſing that the maſters of wharfs and cranes ſhould be ſo regardleſs of the limbs, or even lives of their workmen, that, excepting the late Sir *James Creed* of Greenwich, and ſome gentlemen at Briſtol, there is ſcarce an inſtance of any who has uſed this ſafe contrivance.

The ſtructure of wheel-carriages is generally ſo well known, that it would be needleſs to deſcribe them. And therefore, we ſhall only point out ſome inconveniencies attending the common method of placing the wheels, and loading the waggons.

In coaches, and all other four-wheeled carriages, the fore wheels are made of a leſs ſize than the hind ones, both on account of turning ſhort, and to avoid cutting the braces: otherwiſe, the carriage would go much eaſier if the fore-wheels were as high as the hind ones; and the higher the better, becauſe their motion would be ſo much the ſlower on their axles, and conſequently the friction proportionably taken off. But carriers and coachmen give another reaſon for making the fore-wheels much lower than the hind-wheels; namely, that when they are ſo, the hind-wheels help to puſh on the fore ones: which is too unphiloſophical and abſurd to deſerve a refutation; and yet for their ſatisfaction, we ſhall ſhew by experiment that it has no exiſtence but in their own imaginations.

It is plain, that the ſmall wheels muſt turn as much oftener round than the great ones, as their circumferences are leſs. And therefore, when the carriage is loaded equally heavy on both axles, the fore-axle muſt endure as much more friction, and conſequently wear out as much ſooner, than the hind-axle, as the fore-wheels are leſs than the hind ones. But the great misfortune is, that all the carriers to a man do obſtinately perſiſt, againſt the cleareſt reaſon and demonſtration, in putting the heavier part of the load upon the fore-axle of the waggon; which not only makes the friction greateſt where it ought to be leaſt, but alſo preſſeth the fore-wheels deeper into the ground than the hind wheels, notwithſtanding the fore-wheels, being leſs than the hind ones, are with ſo much the greater difficulty drawn out of a hole or over an obſtacle, even ſuppoſing the weights on their axles were equal. For the difficulty, with equal weights, will be as the depth of the hole or height of the obſtacle is to the ſemidiameter of the wheel. Thus, if we ſuppoſe the ſmall wheel D (fig 4.) of the waggon AB to fall into a hole of the depth EF, which is equal to the ſemidiameter of the wheel, and the waggon to be drawn horizontally along; it is evident, that the point E of the ſmall wheel will be drawn directly againſt the top of the hole; and therefore, all the power of horſes and men will not be able to draw it out, unleſs the ground gives way before it. Whereas, if the hind wheel C falls into ſuch a hole, it ſinks not near ſo deep in proportion to its ſemidiameter; and therefore, the point G of the large wheel will not be drawn directly, but obliquely, againſt the top of the hole; and ſo will be eaſily got out of it. Add to this, that ſince a ſmall wheel will often ſink to the bottom of a hole, in which a great wheel will go but a very little way, the ſmall wheels ought in all reaſon to be loaded with leſs weight than the great ones; and then the heavier part of the load would be leſs jolted upward and downward, and the horſes tired ſo much the leſs as their draught raiſed the load to leſs heights.

It is true, that when the waggon road is much up hill, there may be danger in loading the hind part much heavier than the fore part; for then the weight would overhang the hind axle, eſpecially if the load be high, and endanger tilting up the fore-wheels from the ground. In this caſe, the ſafeſt way would be to load it equally heavy on both axles; and then, as much more of the weight would be thrown upon the hind-axle than upon the fore one, as the ground riſes from a level below the carriage. But as this ſeldom happens, and when it does, a ſmall temporary weight laid upon the pole between the horſes would overbalance the danger; and this weight might be thrown into the waggon when it comes to level ground; it is ſtrange that an advantage ſo plain and ſo obvious as would ariſe from loading the hind-wheels heavieſt, ſhould not be laid hold of, by complying with this method.

To confirm theſe reaſonings by experiment, let a ſmall model of a waggon be made, with its fore-wheels $2\frac{1}{4}$ inches in diameter, and its hind-wheels $4\frac{1}{2}$; the whole model weighing about 20 ounces. Let this little carriage be loaded any how with weights, and have a ſmall cord tied to each of its ends, equally high from the ground it reſts upon; and let it be drawn along a horizontal board, firſt by a weight in a ſcale hung to the cord at the fore part; the cord going over a pulley at the end of the board to facilitate the draught, and the weight juſt ſufficient to draw it along. Then, turn the carriage, and hang the ſcale and weight to the hind cord, and it will be

be found to move along with the ſame velocity as at firſt: which ſhews, that the power required to draw the carriage is all the ſame, whether the great or ſmall wheels are foremoſt; and therefore the great wheels do not help in the leaſt to puſh on the ſmall wheels in the road.

Hang the ſcale to the fore cord, and place the fore-wheels (which are the ſmall ones) in two holes, cut three eighth-parts of an inch deep into the board; then put a weight of 32 ounces into the carriage, over the fore-axle, and an equal weight over the hind one: this done, put 44 ounces into the ſcale, which will be juſt ſufficient to draw out the fore-wheels: but if this weight be taken out of the ſcale, and one of 16 ounces put into its place, if the hind-wheels are placed in the holes, the 16 ounces weight will draw them out; which is little more than a third part of what was neceſſary to draw out the fore-wheels. This ſhews, that the larger the wheels are, the leſs power will draw the carriage, eſpecially on rough ground.

Put 64 ounces over the axle of the hind-wheels, and 32 over the axle of the fore ones, in the carriage; and place the fore-wheels in the holes: then, put 38 ounces into the ſcale, which will juſt draw out the fore-wheels; and when the hind ones come to the hole, they will find but very little reſiſtance, becauſe they ſink but a little way into it.

But ſhift the weights in the carriage, by putting the 32 ounces upon the hind axle, and the 64 ounces upon the fore one; and place the fore wheels in the holes; then, if 76 ounces be put into the ſcale, it will be found no more than ſufficient to draw out theſe wheels; which is double the power required to draw them out, when the lighter part of the load was put upon them: which is a plain demonſtration of the abſurdity of putting the heavieſt part of the load in the fore part of the waggon.

Every one knows what an outcry was made by the generality, if not the whole body, of the carriers, againſt the broad-wheel act; and how hard it was to perſuade them to comply with it, even though the government allowed them to draw with more horſes, and carry greater loads, than uſual. Their principal objection was, that as a broad wheel muſt touch the ground in a great many more points than a narrow wheel, the friction muſt of courſe be juſt ſo much the greater; and conſequently, there muſt be ſo many more horſes than uſual, to draw the waggon. It is believed that the majority of people were of the ſame opinion, not conſidering, that if the whole weight of the waggon and load in it bears upon a great many points, each ſuſtains a proportionably leſs degree of weight and friction, than when it bears only upon a few points; ſo that what is wanting in one, is made up in the other; and therefore will be juſt equal under equal degrees of weight, as may be ſhewn by the following plain and eaſy experiment.

Let one end of a piece of packthread be faſtened to a brick, and the other end to a common ſcale for holding weights: then, having laid the brick edgewiſe on a table, and let the ſcale hang under the edge of the table, put as much weight into the ſcale as will juſt draw the brick along the table. Then taking back the brick to its former place, lay it flat on the table, and leave it to be acted upon by the ſame weight in the ſcale as before, which will draw it along with the ſame eaſe as when it lay upon its edge. In the former caſe, the brick may be conſidered as a narrow wheel on the ground; and in the latter, as a broad wheel. And ſince the brick is drawn along with equal eaſe, whether its broad ſide or narrow edge touches the table, it ſhews that a broad wheel might be drawn along the ground with the ſame eaſe as a narrow one (ſuppoſing them equally heavy) even though they ſhould drag, and not roll, as they go along.

As narrow wheels are always ſinking into the ground, eſpecially when the heavieſt part of the load lies upon them, they muſt be conſidered as going conſtantly up hill, even on level ground; and their edges muſt ſuſtain a great deal of friction by rubbing againſt the ſides of the ruts made by them. But both theſe inconveniencies are avoided by broad wheels; which, inſtead of cutting and ploughing up the roads, roll them ſmooth, and harden them; as experience teſtifies in places where they have been uſed, eſpecially either on wettiſh or ſandy ground: though after all it muſt be confeſſed, that they will not do in ſtiff clayey croſs-roads; becauſe they would ſoon gather up as much clay as would be almoſt equal to the weight of an ordinary load.

If the wheels were always to go upon ſmooth and level ground, the beſt way would be to make the ſpokes perpendicular to the naves; that is, to ſtand at right angles to the axles; becauſe they would then bear the weight of the load perpendicularly, which is the ſtrongeſt way for wood. But becauſe the ground is generally uneven, one wheel often falls into a cavity or rut when the other does not; and then it bears much more of the weight than the other does: in which caſe, concave or diſhing wheels are beſt; becauſe when one falls into a rut, and the other keeps upon high ground, the ſpokes become perpendicular in the rut, and therefore have the greateſt ſtrength when the obliquity of the load throws moſt of its weight upon them; whilſt thoſe on the high ground have leſs weight to bear, and therefore need not be at their full ſtrength. So that the uſual way of making the wheels concave is by much the beſt.

The axles of the wheels ought to be perfectly ſtraight, that the rims of the wheels may be parallel to each other; for then they will move eaſieſt, becauſe they will be at liberty to go on ſtraight forewards. But in the uſual way of practice, the axles are bent downward at their ends; which brings the ſides of the wheels next the ground nearer to one another than their oppoſite or higher ſides are: and this not only makes the wheels to drag ſidewiſe as they go along, and gives the load a much greater power of cruſhing them than when they are parallel to each other, but alſo endangers the overturning of the carriage when any wheel falls into a hole or rut; or when the carriage goes in a road which has one ſide lower than the other, as along the ſide of a hill. Thus (in the hind view of a waggon or cart) let AE and BF (fig. 5.) be the great wheels parallel to each other, on their ſtraight axle K, and HCI the carriage loaded with heavy goods from C to G. Then, as the carriage goes on in the oblique road AaB, the centre of gravity of the whole machine and load will be at C (ſee p. 35. col. 1.) and the line

line of direction C*d*D falling within the wheel BF, the carriage will not overset. But if the wheels be inclined to each other at the ground, as AE and BF (fig. 6.) are, and the machine be loaded as before, from C to G, the line of direction C*d*D falls without the wheel BF, and the whole machine tumbles over. When it is loaded with heavy goods (ſuch as lead or iron) which lie low, it may travel ſafely upon an oblique road ſo long as the centre of gravity is at C, and the line of direction C*d* (fig. 5.) falls within the wheels; but if it be loaded high with lighter goods (ſuch as woolpacks) from C to L, (fig. 7.) the centre of gravity is raiſed from C to K, which throws the line of direction K*k* without the loweſt edge of the wheel BF, and then the load overſets the waggon.

If there be ſome advantage from ſmall fore-wheels, on account of the carriage turning more eaſily and ſhort than it can be made to do when they are large; there is at leaſt as great a diſadvantage attending them, which is, that as their axle is below the level of the horſes breaſts, the horſes not only have the loaded carriage to draw along, but alſo part of its weight to bear; which tires them ſooner, and makes them grow much ſtiffer in their hams, than they would be if they drew on a level with the fore axle: and for this reaſon, we find coach-horſes ſoon become unfit for riding. So that on all accounts it is plain, that the fore-wheels of all carriages ought to be ſo high, as to have their axles even with the breaſts of the horſes; which would not only give the horſes a fair draught, but likewiſe cauſe the machine to be drawn by a leſs degree of power.

MECHLIN, a large well built and fortified city of Brabant, twelve miles north eaſt of Bruſſels.

MECHOACAN, a province of Mexico, bounded by Panuco, on the north; by Mexico Proper, on the eaſt; by the Pacific ocean, on the ſouth; and by Guadalajara, or New Galicia, on the weſt.

MECKLENBURG DUCHY, a province of Germany, in the province of Lower Saxony, about 100 miles long, and 60 broad; bounded by the Baltic ſea, on the north; by Pomerania, on the eaſt; by Brandenburg, on the ſouth; and by the duchies of Holſtein, Lunenburg, and Lawenburg, on the weſt.

MECON, a great river, which riſes in the north of further India, and, running ſouth through the kingdows of Laos and Cambodia, falls into the Indian ocean.

MECONIUM, in medicine, a black thick fæces gathered in the inteſtines of infants, and brought with them into the world at the time of their birth.

MECONIUM, in pharmacy, the extract of Engliſh poppies.

Meconium has all the virtues of the foreign opium, but in a ſomewhat lower degree. See OPIUM.

MEDAL, a piece of metal in the form of coin, intending to convey to poſterity the portrait of ſome great perſon, or the memory of ſome illuſtrious action.

The parts of a medal are the two ſides, one of which is called the face or head, and the other the reverſe. On each ſide is the area, or field, which makes the middle of the medal; the rim, or border; and the exergum: and one the two ſides are diſtinguiſhed the type or the figure repreſented, and the legend or inſcription.

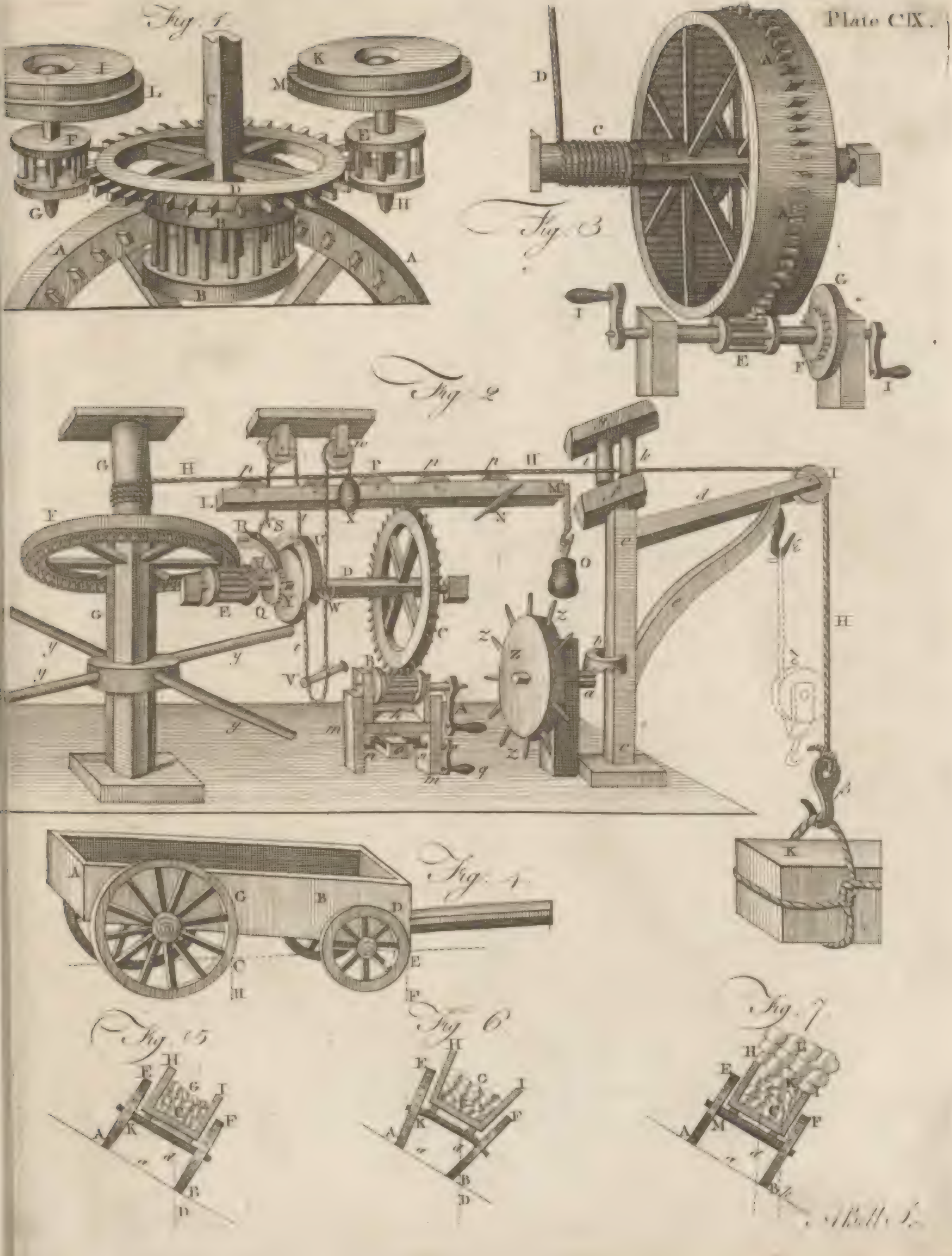
As to the antiquity of medals, the Greek are certainly the moſt ancient; for long before the building of Rome the Greeks had beautiful money in gold, ſilver, and copper. This plainly appears from ſeveral genuine medals of Macedon, older than Philip and Alexander; from Greek medals with the names of ſeveral magiſtrates prior to the Macedonian empire; to which we may add ſome Sicilian coins of ſtill greater antiquity. As the Greek medals are the moſt ancient, ſo are they the moſt beautiful; they have a deſign, accuracy, force, and delicacy, that expreſſes even the muſcles and veins, and are ſtruck with ſuch exquiſite art, as the Romans could never come up to. Thoſe ſtruck when Rome was governed by conſuls, are the moſt ancient among the Romans: but the copper and ſilver medals do not go beyond the 484th year of Rome, nor the gold beyond the year 546. Among the imperial medals, we diſtinguiſh between the upper and lower empire: the firſt commenced under Julius Cæſar, and ended A. D. about 260; the lower empire includes near 1200 years, and ends at the taking of Conſtantinople. It is the cuſtom, however, to account all the imperial medals till the time of the Paleologi, among the antique; though we have none of any conſiderable beauty later than the time of Heraclius, who died in 641. The Gothic medals make part of the imperial ones. Modern medals are thoſe ſtruck within theſe 300 years. There are no true Hebrew medals, except a few ſhekels of copper and ſilver, but none of gold; though there is mention made of one in the king of Denmark's cabinet.

There was formerly no difference between money and medals. An old Roman had his purſe full of the ſame pieces that we now preſerve in cabinets. As ſoon as an emperor had done any thing remarkable, as gaining a victory, giving up a tax, or the like, it was immediately ſtamped on a coin, and became current thro' his whole dominions. This was a pretty device to ſpread abroad the virtues of an emperor, and make his actions circulate; and thus a freſh coin was a kind of gazette, that publiſhed the lateſt news of the empire.

Several of our modern coins have the legend round the edges: but the ancients were too wiſe to regiſter their exploits on ſo nice a ſurface. As to the figures upon medals, the Romans always appear in the proper dreſs of their country, ſo that we may obſerve the little variations of the mode in the drapery of the medal: they would have thought it ridiculous to have drawn an emperor of Rome in a Grecian cloak or a Phyrgian mitre. On the contrary, we often ſee a king of England or France dreſſed up like a Julius Cæſar, as if they had a mind to paſs themſelves upon poſterity for

Roman

Plate CIX.



Roman emperors. Nothing is more uſual than to ſee alluſions to Roman cuſtoms and ceremonies on the medals of our own nation; nay, they very often carry the figure of an heathen god. If poſterity take its notions of us from our medals, they muſt fancy that one of our kings paid a great devotion to Minerva, another to Apollo, *&c.* or, at leaſt, that our whole religion was a mixture of paganiſm and Chriſtianity. Had the old Romans been guilty of the ſame extravagance, there would have been ſo great a confuſion in their antiquities, that their coins would not have had half the uſe we now find in them.

The uſe of medals is very conſiderable: they give a very great light into hiſtory, in confirming ſuch paſſages as are true in old authors, in reconciling ſuch as are told in different manners, and in recording ſuch as have been omitted. In this caſe a cabinet of medals is a body of hiſtory. It was, indeed, the beſt way in the world to perpetuate the memory of great actions, thus to coin out the life of an emperor, and to put every exploit into the mint. It was a kind of printing before the art was invented; and they have this advantage over books, that they tell their ſtory quicker, and ſum up a whole volume in twenty or thirty reverſes: thus Mr Vaillant, out of a ſmall collection of medals, has given us a chronicle of the kings of Syria. They are indeed the beſt epitomes in the world, and let us ſee, with one caſt of the eye, the ſubſtance of above an hundred pages. Another uſe of medals is, that they not only ſhew the actions of an emperor, but at the ſame time mark out the year in which they were performed; for as every exploit has its date ſet to it, a ſeries of an emperor's coins is his whole life digeſted into annals. A medalliſt, upon the firſt naming of an emperor, will immediately tell his age, family, and life. To remember where he enters in the ſucceſſion, he only conſiders in what part of the cabinet he lies; and by running over in his thoughts ſuch a particular drawer, will give an account of all the remarkable parts of his reign. Nor are medals of leſs uſe in architecture, painting, poetry, *&c.* A cabinet of medals is a collection of pictures in miniature, and by them the plans of many of the moſt conſiderable buildings of antiquity are preſerved.

Impreſſions of MEDALS. A very eaſy and elegant way of taking the impreſſions of medals and coins, not generally known, is thus directed by Dr Shaw: Melt a little iſinglaſs-glue made with brandy, and pour it thinly over the medals, ſo as to cover its whole ſurface: let it remain on for a day or two, till it is thoroughly dry and hardened; and then taking it off, it will be fine, clear, and hard, as a piece of Muſcovy glaſs, and will have a very elegant impreſſion of the coin.

Another eaſy method is as follows: Take a perfect and ſharp impreſſion, in the fineſt black ſealing-wax, of the coin or medal you deſire. Cut away the wax round the edges of the impreſſion; then with a preparation of gum-water, of the colour you would have the picture, ſpread the paint upon the wax-impreſſion with a ſmall hair pencil, obſerving to work it into all the ſinking or hollow places, theſe being the riſing parts of the medal; and the colour muſt be carefully taken from the other parts with a wet finger. Then take a piece of very thin poſt-paper, a little larger than the medal, and moiſten it quite through. Place it on the wax impreſſion; and on the back of the paper lay three or four pieces of thick woolen cloth or flannel, of about the ſame ſize. The impreſſion, with its coverings, ſhould be placed between two ſmooth iron plates, about two inches ſquare, and one tenth of an inch thick. Theſe muſt be carefully put into a ſmall preſs, made of two plates of iron, about five inches and a half long, one inch and a half wide, and half an inch in thickneſs, having a couple of long male-ſcrews running through them, with a turning female-ſcrew on each, to force the plates together. Theſe being brought evenly together, by means of the ſcrews, will take off a true and fair picture of the medal; which, if any deficiencies ſhould appear, may eaſily be repaired with a hair pencil, or pen, dipped in the colour made uſe of.

If a relievo only be deſired, nothing is neceſſary, but to take a piece of card, or white paſte-board, well ſoaked in water; then placing it on the wax-mould, without any colouring, and letting it remain in the preſs for a few minutes, a good figure will be obtained.

This method of taking off medals, *&c.* is convenient, and ſeems much more ſo than the ſeveral inventions uſually practiſed in ſulphur, plaſter of Paris, paper, *&c.* wherein a mould muſt be formed, either of clay, horn, plaſter, or other materials, which requires a good deal of time and trouble.

MEDALLION, or MEDALION, a medal of an extraordinary ſize, ſuppoſed to be anciently ſtruck by the emperors for their friends, and for foreign princes and embaſſadors; but that the ſmallneſs of their number might not endanger the loſs of the devices they bore, the Romans generally took care to ſtamp the ſubject of them upon their ordinary coins.

Medallions, in reſpect of the other coins, were the ſame as modern medals in reſpect of modern money: they were exempted from all commerce, and had no other value but what was ſet upon them by the fancy of the owner. Medallions are ſo ſcarce that there cannot be any ſet made of them, even though the metals and ſizes ſhould be joined promiſcuouſly.

MEDELPADIA, a ſmall province of Sweden lying northward of Helſingia.

MEDEOLA, in botany, a genus of the hexandria trigynia claſs. It has no calix; the corolla conſiſts of ſix revoluted ſegments; and the berry contains three ſeeds. There are two ſpecies, none of them natives of Britain

MEDIA, in geography, the ancient name of Gilan. See GILAN.

MEDIANA. See ANATOMY, p. 241.

MEDIASTINUM, in anatomy. See ANATOMY, p. 278.

MEDIATE, or INTERMEDIATE, ſomething that ſtands between and connects two or more terms, conſidered as

as extremes; in which ſenſe it is oppoſed to immediate.

MEDICAGO, in botany, a genus of the diadelphia decandria claſs. The pod is compreſſed; and the carina of the corolla declines from the vexillum. There are nine ſpecies, four of them natives of Britain, *viz.* The falcata, or yellow medic; the ſativa, or lucern; the lupulina, or melilot trefoil; and the arabica, or heart-trefoil.

MEDICINE.

MEDICINE is generally defined to be, The art of preſerving health when preſent, and of reſtoring it when loſt.

Men would never think of any particular regimen or mode of living in order to preſerve health, before they felt the pains which accompany the want it. The firſt painful ſenſation muſt neceſſarily have produced a deſire for relief. But in a period when phyſicians and medicines were equally unknown, how was that relief to be obtained? or what ſyſtem of conduct would man in this ſituation naturally follow? Whoever can anſwer theſe queſtions, will unfold the genuine principles of the medical art, and give an infallible ſtandard for judging what progreſs has been made in the improvement of it, what particular circumſtances have contributed to obſtruct or forward the knowledge and cure of diſeaſes.

Medicine being thus founded on a powerful inſtinct in human nature, its exiſtence in ſome form muſt have been coeval with the firſt diſeaſe that appeared among mankind. Moſt arts require the experience of ages before they can arrive at a high degree of perfection. Medicine is unqueſtionably one of the moſt ancient; and conſequently, the improvement of it might be expected to bear ſome proportion to its antiquity. But, whilſt philoſophy, in all its branches, has been cultivated and improved to a great extent; medicine, notwithſtanding the collateral advantages it has of late derived from anatomy and other ſciences, ſtill continues to be buried in rubbiſh and obſcurity.

Many cauſes have contributed to retard our progreſs in the knowledge of the cauſes and cure of diſeaſes. In the early ages, preſcriptions were either the reſult of tradition founded upon uncertain facts, or mere random trials without any rational view of ſucceſs: Accordingly, when any uncommon caſe occurred, the patients were placed in croſs-ways, and other public places, to receive the advice of paſſengers who might chance to know the diſeaſe or an efficacious remedy. In this way valuable medicines might be accidentally diſcovered. But memory, and, in remarkable cures, engravings on pillars or the walls of temples, were poor inſtruments for recording the ſymptoms of diſeaſes, and the ingredients of preſcriptions.

After the knowledge of medicine began to be ſtudied and practiſed as a liberal profeſſion, a jealouſy of reputation, joined to a thirſt for money and ignorance of philoſophy, laid a ſolid foundation for medical diſputation. One party of phyſicians, known by the name of Empyrics, excluded all reaſoning, and truſted ſolely to experience. Another party, called Dogmatiſts, maintained, that no man ought to preſcribe, without being able to give a theory both of the diſeaſe and of the nature and action of the medicine. This diſpute continued for ages, and, like other diſputes of a ſimilar nature, remains ſtill in ſome meaſure undecided. The principles of both theſe parties are unqueſtionably good. But the phyſician who excludes either of them, will make but little progreſs in the knowledge of his profeſſion. A judicious mixture of the two is indiſpenſably neceſſary. Indeed it is difficult to determine whether too great an attachment to empyriciſm or dogmatiſm has contributed moſt to obſtruct the improvement of phyſic.

But there is one cauſe which has operated more powerfully in preventing the improvement of medicine than even a combination of all the other cauſes. Moſt branches of philoſophy are principally cultivated by people who expect their reward in reputation, not in money. The practice of phyſic is become as literally a trade as any branch of buſineſs whatever. Young men are taught phyſic with no other view than that of gaining their bread. Whenever a phyſician gets into extenſive practice, he may buſtle and make a noiſe; but, even ſuppoſing his abilities to be great, he can never find leiſure to think, or digeſt his obſervations.

Another cauſe of the imperfect ſtate of medicine ariſes from the varieties in conſtitutions, and the complex nature of diſeaſes. It is even extremely difficult, after a diſeaſe has been cured, to determine with certainty, whether the cure was performed by the operation of nature, or by any particular virtue in the medicine. This difficulty is greatly increaſed by the variety of different medicines, and different ingredients in the ſame medicine, which are commonly adminiſtred during the courſe of a diſeaſe.

Of late ſeveral attempts have been made to reduce medicine into the form of a regular ſcience, by diſtributing diſeaſes into claſſes, orders, genera, and ſpecies. Sauvage was the firſt, and indeed the only perſon who ever attempted to complete this great work. Others, as Linnæus, Vogel, Dr Cullen, *&c.* have ſince endeavoured to improve Sauvage's method of claſſing; but they have contented themſelves with an enumeration of the characters and arrangement of the different genera, without entering into their hiſtory or cure. Sauvage enumerates 315 genera, Linnæus 325, Vogel 560, and Dr Cullen has reduced them to 132. The bare inſpection of theſe numbers ſhews, that phyſicians are far from being agreed with regard to what conſtitutes the generic or ſpecific characters of a diſeaſe. Indeed, we may venture to affirm, that they never will agree upon this point: The diagnoſtic ſymptoms of diſeaſes are not ſo eaſily diſcovered as the ſtamina or petals in a flower, or the number of teeth or toes in

in a quadruped. However, before making any observations on the advantages or disadvantages that may probably result from the classification of diseases, we shall lay before our readers the last and shortest distribution, published last year by Dr Cullen, one of the professors of medicine in the university of Edinburgh, under the title of *Synopsis Nosologiæ Methodicæ*, or rather, *Genera Morborum Præcipua*.

The doctor divides diseases into the four following classes, *viz.*

CLASS. I. PYREXIÆ, or Feverish Disorders.
II. NEUROSES, or Nervous Diseases.
III. CACHEXIÆ; comprehending such disorders as proceed from a diseased state of the whole or any part of the body, without an original fever, or any nervous complaint.
IV. LOCALES; comprehending diseases which affect a part only, not the whole body.

The *first* class (PYREXIÆ) is subdivided into five orders, *viz.*

ORDER I. FEBRES, or Fevers, is subdivided into two sections, *viz.* 1 Intermittent; and, 2. Continued fevers.—The first section contains three genera, *viz.* 1. The Tertian fever; 2. The Quartan; 3. The Quotidian:—The second section likewise contains three genera, *viz.* 1. The Synocha; 2. The Typhus; 3. The Synochus.

ORDER II. PHLEGMASIÆ, or fevers accompanied with any local pain. This order contains 17 genera, *viz.* 1 Phlegmone; 2. Ophthalmia; 3. Phrenitis; 4. Cynanche; 5 Peripneumonia; 6. Pleuritis; 7. Carditis; 8. Peritonitis; 9. Gastritis; 10. Enteritis; 11 Hepatitis; 12. Splenitis; 13. Nephritis; 14. Cystitis; 15. Hysteritis; 16. Rheumatismus; 17. Arthritis.

ORDER III. EXANTHEMETA, or eruptive fevers; comprehending 10 genera, *viz.* 1. Erysipelas; 2. Pestis; 3 Variola; 4. Varicella; 5. Rubeola; 6. Miliaria; 7. Scarlatina; 8. Urticaria; 9. Pemphigus; 10. Aphtha.

ORDER IV. HÆMORRHAGIÆ, or fevers accompanied with a flux of blood, not proceeding from any external cause. This order comprehends 4 genera, *viz.* Epistaxis; 2 Hæmoptysis; 3. Hæmorrhois; 4. Menorrhagia.

ORDER V PROFLUVIA, or fevers attended with an increased secretion, not naturally of the bloody kind. This order contains 2 genera, *viz.* 1. Catarrhus; 2. Dysenteria.

The *second* class (NEUROSES) is subdivided into four orders, *viz*

ORDER I. COMATA, or lethargic diseases; containing 3 genera, *viz.* 1. Apoplexia; 2. Paralysis; 3. Catalepsis.

ORDER II. ADYNAMIÆ, or diseases arising from a stoppage or diminution in any of the involuntary motions, whether vital or natural. This order contains 4 genera, *viz.* 1. Syncope; 2. Dyspepsia; 3. Hyponchondriasis; 4 Chlorosis.

ORDER III. SPASMI, or irregular motions of the muscular fibres. This order contains 13 genera, *viz.* 1. Tetanus; 2. Convulsio; 3. Epilepsia; 4. Palpitatio; 5. Asthma; 6. Pertussis; 7. Pyrosis; 8. Colica; 9. Cholera; 10. Diarrhœa; 11. Diabetes; 12. Hysteria; 13. Hydrophobia.

ORDER IV. VESANIÆ, or diseases of the mind, without a fever or coma. This order contains 4 genera, *viz.* 1. Amentia; 2. Melancholia; 3. Mania; 4. Somnium.

The *third* class (CACHEXIÆ, or diseases arising from a depraved state of the whole or a great part of the body, without a fever or nervous complaint,) is subdivided into 3 orders, *viz*

ORDER I. MARCORES, or diseases attended with a wasting of the whole body; containing 2 genera, *viz.* 1. Tabes; 2 Atrophia.

ORDER II. INTUMESCENTIÆ, or diseases accompanied with an external swelling of the whole or a great part of the body. This order contains 13 genera, *viz.* 1. Polysarcia; 2. Pneumatosis; 3. Tympanites; 4. Physometra; 5. Anasarca; 6. Hydrocephalus; 7. Hydrorachitis; 8. Hydrothorax; 9. Ascites; 10. Hydrometra; 11. Hydrocele; 12. Physconia; 13 Rachitis.

ORDER III IMPETIGINES, or diseases attendedwth a cachexy which deforms the skin and external parts of the body. This order contains 8 genera, *viz.* 1. Scrophula; 2. Syphilis; 3. Scorbutus; 4. Elephantiasis; 5. Lepra; 6. Frambæsia; 7 Trichoma; 8. Icterus.

The *fourth* class (LOCALES, or diseases affecting only a part of the body,) is subdivided into seven orders, *viz.*

ORDER I. DYSÆSTHESIÆ, or diseases arising from any of the senses being destroyed or impaired by a fault in the external organs of sensation. There are 8 genera in this order, *viz.* 1. Caligo; 2. Amblyopia; 3. Dysecœa; 4. Paracusis; 5. Anosmia; 6. Agheustia; 7. Anæsthesia; 8. Anaphrodisia.

ORDER II DYSCINESIÆ, or diseases attended with the destruction or defect of motion in any part through a fault of the organs. This order contains 6 genera, *viz* 1. Aphonia; 2. Mutitas; 3. Paraphonia; 4. Psellismus; 5. Strabismus; 6. Contractura.

ORDER III. APOCENOSES, or diseases attended with an increased flux of the blood or other humours, without a fever, or increased motion of the fluids. This order contains 5 genera, *viz.* 1. Profusio; 2. Epiphora; 3. Ptyalismus; 4. Enuresis; 5. Gonorrhœa.

ORDER IV. EPISCHESES, or diseases arising from a suppression or obstruction of any usual excretions. This order contains 3 genera, *viz.* 1. Obstipatio; 2 Ischuria; 3. Amenorrhœa.

ORDER V. TUMORES, or diseases attended with an increased size of the part, without a phlegmon. This order contains 14 genera, *viz.* 1. Aneurisma; 2. Varix; 3. Ecchymoma; 4. Schirrus; 5. Cancer; 6. Bubo; 7. Sarcoma; 8. Verruca; 9. Clavus; 10. Lupia; 11. Ganglion; 12. Hydatis; 13. Hydrarthrus; 14. Exostosis.

ORDER VI. ECTOPIÆ, comprehending diseases arising

ſing from any part's being removed from its proper ſituation, and cauſing a tumor. This order contains 3. genera, *viz.* 1. Hernia; 2. Prolapſus; 3. Luxatio.

ORDER VII. DIALYSES; comprehending ulcers, and all kinds of wounds. This order contains 7 genera, *viz.* 1. Vulnus; 2. Ulcus; 3. Herpes; 4. Tinea; 5. Pſora; 6. Fractura; 7. Caries.

It is needleſs to enter into an examination of the propriety or impropriety of this or any of the other modes of diſtribution. Every one of them are defective in many particulars. Sauvage, Vogel, Linnæus, Dr Cullen, have each adopted peculiar theories of particular diſeaſes. Theſe theories conſtitute the baſis of their different claſſifications. A perſon, therefore, who is not previouſly acquainted with theſe theories will naturally be ſurpriſed to find ſome diſeaſes arranged under certain claſſes and orders. For example, who would expect to find a diarrhœa ranked under the claſs of Neuroſes, and in the order of Spaſmi, without knowning Dr Cullen's particular theory concerning the cauſe of that diſeaſe? The generic characters of many diſeaſes will likewiſe be totally unintelligible to ſuch a perſon.

However, notwithſtanding theſe defects ariſing from the theoretical diſtribution of diſeaſes, we cannot heſitate a moment in preferring even a bad method of claſſing to none at all. Every attempt towards a juſt and natural arrangement of diſeaſes is laudable, and has a direct tendency to introduce ſcience into the medical art; an object greatly to be wiſhed for, but which ſtill appears to be very diſtant There is, however, a danger attending attempts of this kind which deſerves to be pointed out. In every art which is not founded upon known facts and eſtabliſhed principles, new projects are eagerly graſped at; and, though they lead to error and falſe reaſoning, it is long before the profeſſors of that art can be induced to give over the purſuit. This obſervation is peculiarly applicable to medicine. The theories of diſeaſes, as well as the mode of preſcription, are as variable as the faſhions of a lady's head-dreſs. No other argument is neceſſary to ſhew the crude ſtate of the art, and the boundleſs field for improvement. Now, the great danger ariſing from the claſſing of diſeaſes is this:—It will divide phyſicians, in the firſt place, into two great parties: the one party will ſpend much time and genius in ſhewing the uſeleſſneſs of claſſing in general, and particularly in the preſent imperfect ſtate of the art; the other will imitate their example in defending with equal keenneſs. Nay, what is ſtill worſe, every profeſſor belonging to this laſt party, beſides ſpending much time to little purpoſe in juſtifying claſſification in general, will conſume ſtill more time in criticiſms upon every other mode of claſſing beſides the one he chuſes to adopt. Now, this buſtle about claſſification among the teachers of medicine, will naturally lead the minds of unexperienced ſtudents to conclude, that the whole ſcience conſiſts in a particular arrangement of diſeaſes, and that they cannot make a more proper diſplay of their medical knowledge, than by diſcovering an acquaintance with all the various methods of claſſification, and an acuteneſs in criticiſing all the other methods but that particular one which he has been taught to believe as infallible.

Having thus given a ſhort account of the origin and preſent ſtate of phyſic, we ſhall now proceed to the hiſtory and treatment of diſeaſes.

Of FEVERS *in general.*

HOFFMAN defines a fever to be, "A ſpaſmodic affection of the whole nervous and vaſcular ſyſtem, annoying all the functions of the body, ariſing from any cauſe which has power to irritate the nervous parts to a more intenſe contraction; and when it operates, it drives the vital fluids from the outward parts to the heart and great veſſels; and afterwards, when the ſyſtole of the heart and arteries are increaſed, they are drove back with rapidity and heat, through the conſtricted veſſels, to the outward parts again, till the ſpaſms being relaxed, the ſecretions are performed, and the fever vaniſhes."

The formal or fundamental cauſe of a fever conſiſts in the ſpaſmodic affection of the whole nervous and fibrous genus. This plainly appears from the uſual phænomena of a fever, *viz* a pain in the back, more particularly about the loins; a coldneſs, eſpecially of the extreme parts; a ſhivering, ſhaking, trembling; a livid colour of the nails; a ſubſidence of the veſſels of the hands and feet; a ſhrunk, dry ſkin; a yawning; a ſtretching; a pale, livid countenance; a trembling and palpitating motion of the heart; an anxiety of the præcordia, difficult breathing, inquietude, reſtleſſneſs; a ſenſation of an ebullition of the blood about the heart; a contracted, weak, ſmall pulſe; a nauſea, and an inclination to vomit; a ſuppreſſion of perſpiration; coſtiveneſs, with thin watery urine.

Hence it naturally follows, that whatever has a power to irritate and ſolicit the nervous and vaſcular ſyſtem to ſpaſms, is moſt likely to generate a fever. To this claſs belong violent paſſions of the mind, eſpecially terror and anger; a poiſonous, ſubtle, cauſtic matter, either bred within the body, or received by infection; a ſtoppage of perſpiration; a ſuppreſſion of critical ſweats; eruptions driven back; an abundance of purulent ulcerous matter adhering to various parts; aliments too acrid and ſharp; corrupt and bilious crudities lodged in the primæ viæ; exceſſive watching; a violent pain and tenſion of the nervous parts; inflammations, tumours, and abſceſſes; hurting the nervous parts by ſharp inſtruments; acrid and corroſive drugs; cold baths, and, on the contrary, thoſe that are too hot or aſtringent.

According to the different nature of theſe cauſes, and the various manner of affecting the nerves, ariſe fevers of divers kinds. Some are benign, others malignant; ſome are intermitting, others continual; ſome are ſimple, others compound; others regular or anomalous; eruptive, ſpotted, putrid, hectic, or ſlow. Some admit of an eaſy cure, others a difficult; ſome ſoon terminate, others are protracted a long time; and many hurry the patient ſuddenly out of the world.

Yet, every frequent ſyſtole of the heart and arteries diſcoverable by the pulſe ought not to be called a fever. For theſe may often ariſe from violent bodily exerciſe; or, from a commotion in the blood cauſed by hot and ſpirituous liquors. That only which ariſes from internal cauſes, and is preceded by ſhivering, ſhaking, and coldneſs

nefs of the extreme parts, is properly a fever: For there is always, as it were, a double motion in a fever; the one from the circumference to the centre, or from the external parts to the internal, the heart and lungs; the other from the centre to the circumference. The firft motion is attended with a fmall, contracted, weak, pulfe, with an anxiety of the præcordia and difficulty of breathing; the fecond with an increafed motion of the arteries, a large pulfe, and heat extended even to the extreme parts.

The caufe of the febrile motion is an univerfal fpafm; and that motion never ceafes till the fpafm is refolved. The figns of its being refolved are, a free perfpiration, and a breathing fweat; the pulfe, which before was hard, impetuous, and quick, becomes foft, moderate, and flow; the urine lets fall a fediment, and the ftrength gradually returns. When thefe appear all together, they declare the folution of the difeafe, and are called the crifis.

Of Intermitting Fevers, *or* Agues.

This fever is of the regular kind, and is attended with the following fymptoms. At firft, the head aches, the limbs feem weary; there is a pain in the loins about the firft vertebra of the back, which afcends towards the epigaftrium, with a painful fenfe of a tenfion in the hypochondria, and coftivenefs: then comes on a coldnefs of the external parts, efpecially of the nofe and ears; a ftretching, yawning; a fhivering and fhaking, fometimes even to make the bed tremble under the patient; the pulfe is fmall, contracted, and weak: again the patient is troubled with thirft; then follows a naufea, with a fruitlefs reaching to vomit; again, a pituitous, bilious, or green matter is brought up, commonly joined with a troublefome cough, and an expectoration of phlegm derived from the acid clammy crudities of the ftomach; to thefe fucceeds an anxious burning and dry heat, which pervades the whole body. The face, which was collapfed and pale, the contracted, rigid fkin, and the empty veffels of the hands and feet, begin to rife, and grow red and turgid; the pulfe becomes more great, full, and quick; the reftleffnefs increafes, the breathing is more difficult, and the patient, with his eyes almoft clofed, begins to talk a little wildly.

Afterwards, the fymptoms begin to abate, the heat becomes mild, the fkin relaxes and grows moift; the urine is of a flame colour, but without a fediment; the pulfe is more moderate; and then a fweat breaking out, terminates the paroxyfm. The duration of the fit is uncertain; fometimes it ends in ten or eleven hours, and fometimes not till twenty-four. On the intercalary day, the body is ftill feeble and coldifh, with a difpofition to fhiver; the pulfe is flow and weak; the urine is turbid, and depofites a fediment, or there is a nubecula which fhews a difpofition thereto.

In the Bastard or Spurious Tertian, the fymptoms are milder, the heat is not fo burning, the vomiting is not fo frequent, and the urine is not fo high-coloured; but then it is a more lingring complaint, and on the well day there is a laffitude and want of appetite. This attacks men of an inactive difpofition, and women whofe bodies are of a loofe texture, in the autumnal feafon.

The fit of the Irregular Tertian obferves no particular time; for it fometimes comes on in the morning, fometimes in the afternoon, in the evening, or at midnight. The paroxyfm is fometimes longer, fometimes fhorter; the urine lets fall no fediment within the time of remiffion or intermiffion; the fweating is either too fparing or too profufe. When the fit is off, feveral unufual fymptoms may appear; as, a loofenefs, a bleeding at the nofe, ficknefs at the ftomach, a violent heartburn, pains in the belly, or the gripes. Thefe fort of agues are generally Epidemic, and moft commonly appear in the fummer and autumn.

Sometimes a tertian ague is double, which may be diftinguifhed from a quotidian, by the time of the fits, which is not the fame every day, but every other day.

There is fometimes a Continual Tertian, which begins with fhivering and fhaking, an anxiety, vomiting, lofs of ftrength, and then a violent heat. The fits do not intermit, but only remit. The pulfe continues frequent with heat and debility, and all the fymptoms return with frefh vigour every other day; but at length admit a perfect intermiffion.

An Endemic Tertian is proper to certain places; as a low fituation, and full of marfhes, producing a great number of gnats and other infects, like fome parts of Kent, and the hundreds of Effex. In fuch places, the natives themfelves have a little of it every year; and ftrangers feldom or never efcape, without a prefervative, which is only the bark infufed in brandy, with a little fnake root, of which two ounces night and morning are to be taken.

A QUARTAN AGUE has two fits in four days, or two days quite free from a fit.

It begins about four or five in the afternoon, fometimes fooner and fometimes later, with a great laffitude, ftretching, a blunt pain in the head, back, loins and legs; the feet and hands are cold; the whole body is pale; the face and nails livid, to which fhivering and fhaking fupervene. The tongue and the lips tremble, the breathing is difficult, with reftleffnefs and toffing; the pulfe is contracted and hard, and fometimes unequal; and there is an anxiety about the præcordia. Thefe fymptons continue about two or three hours. In fome the body is coftive; in others there is a ftimulus to ftool, and to make water. In fome there is a naufea or vomiting, with ftools. Some advanced in years have their minds pretty much difturbed; the heat comes on gradually, not burning but dry; the pulfe becomes equal, quick, and large; but the dull pain in the head remains, with a vertiginous affection; the fkin becomes only a little moift; and in about four or fix hours the fymptoms vanifh, except a dull pain in the bones, joints and feet. The urine in the fit is fometimes thin and watery, fometimes thick and with a fediment.

Sometimes a quartan ague is double, that is, when the fits come on every other day at different hours; and it is spurious when a paroxyfm begins at any other time of the day but that above-mentioned. It is faid to be continual, when on the intercalary days there are fhiverings and pandiculations, with a greater heat than ufual, a quicker pulfe, a want of appetite, a debility, a drynefs of the mouth, a lightnefs of the head, a difturbed

ed ſleep, and a reddiſh urine, with a thick roſe-coloured ſediment.

A QUOTIDIAN AGUE or fever returns every day, and is not ſo common as the tertian or quartan.

The acceſſion of this fever is about four or five in the morning, with cold and ſhivering; to which ſucceeds a cardialgic nauſea, and inflation of the belly; in ſome, a pain in the head; in others, fainting fits; in moſt, vomiting or ſtools, or both. Then comes on a moderate heat, with thirſt, but not very intenſe. The pulſe, which was before irregular and weak, becomes more quick, but not very hard. The urine is not of a flame but rather of a citron colour, and turbid. Some are exceeding ſleepy. At length a moderate ſleep ſupervenes; and in about ten hours or longer, the fit goes off, leaving the body dull and heavy.

From theſe ſymptoms it appears, that the whole nervous ſyſtem is agitated and ſuffers greatly by ſpaſtic conſtrictions; which proceeding chiefly from the medulla ſpinalis, affect preternaturally not only the coats of the veſſels, but all the fibres throughout the body, thereby greatly diſturbing the motion both of the ſolids and fluids.

The material cauſe of this, and all other fevers, according to Hoffman, is a fluid of an active nature, endued with a cauſtic acrimony, which ſolicits the internal and exquiſitely ſenſible parts to ſpaſtic contractions. It is generated chiefly in the biliary ducts and flexures of the duodenum; where the vitiated, bilious ſalival and pancreatic juices meeting with the crudities of a bad digeſtion, ferment together, and, not being timely expelled, become virulent. This matter paſſing through the lacteals, into the blood, and thence into the nervous parts of the head, medulla ſpinalis, inteſtines, and ſtomach, as alſo to the nervous coats of the excretory and ſecretory ducts, excite an univerſal ſpaſm, which firſt forces the blood to the interior and greater veſſels; and afterwards the ſyſtaltic motion of the heart and arteries being increaſed, the motion of the whole maſs of blood and humours is accelerated, and the obſtructions of the ſmall veſſels of the nervous parts are opened; upon which the ſpaſm ceaſing, the excretory ducts are relaxed, the febrile matter paſſes off through the pores of the ſkin by perſpiration or ſweat, and the fit ceaſes, till by the generation of freſh matter a new paroxyſm is brought on.

As to the cure, when a load of vitiated humours in the ſtomach and duodenum require depletion, which is known from having indulged in too plentiful eating, from an anxiety of the præcordia, from eructations, and a bitter taſte in the mouth, a vomit, after the firſt fit, in the time of intermiſſion, is to be given. In tender conſtitutions, 10 grains of ipecacuanha may be given alone; but to the more robuſt, a grain or two of emetic tartar may be added. Or if it is neceſſary to purge at the ſame time,

1. Take half an ounce of Epſom ſalt, and two or three grains of emetic tartar. Mix them and make them into a powder; to be diſſolved in a pound of pure lukewarm water, and taken two hours after the fit.

The evacuation ought to be facilitated with draughts of water-gruel made fat with freſh butter. Then take the following electuary, which will cruſh the diſeaſe in the bud.

2. Rob of elder, one ounce; 5 drams of Peruvian bark; 2 drams of chamomile flowers in powder; extract of the leſſer centaury, and powder of jelliflowers, of each half a dram; add as much ſyrup of lemon as will make an electuary. Half a dram to be taken every two hours, after the fit has gone off.

But if any thing forbids vomiting, and yet there is plenty of ſerous crude humours which require evacuation, we muſt begin the cure with deterſive and aperient ſalts.

When the whole inteſtinal canal has been cleanſed by theſe ſalts, duely repeated at proper intervals, and the ague ſtill continues, add an equal weight of bark thereto, or give the electuary above preſcribed.

When the patient is obnoxious to the hypochondriac paſſion, the ſtomach inflated, and the body coſtive, neither vomits nor ſalts muſt be ventured upon, but carminative and emollient clyſters.

But it muſt be remembered, that neither bleeding, nor emetics, nor cathartics, nor the bark, nor any ſtrengthener nor aſtringent is to be adminiſtered or given in the fit, or near the time it uſually comes on.

If a tertian is autumnal, obſtinate, or changes to a quotidian, the antifebrile potion of Crollius will be proper.

3. Salt of wormwood, a dram; ſpirit of ſulphur, a ſcruple; 4 ounces of fennel water. Mix them together for a drink.

Let the patient take it juſt as the fit comes on, and be well covered with bed-cloaths.

Bleeding is proper only in a hot ſeaſon, when the heat of the patient is exceſſive, attended with a delirium, and in the prime of life, full of blood, and ſubject to paſſion.

Opiates will appeaſe the ſymptoms; but they diſturb the criſis, and protract the diſeaſe. Likewiſe aluminous, chalybeate, and vitriolic remedies will ſtop the fits; and if they are given to patients of the loweſt claſs, care muſt be taken that they ſweat after them, by drinking hot decoctions, or by exerciſe.

Abſorbents have often a happy effect in theſe diſeaſes; but if given in too great a quantity, they will not diſſolve in the ſtomach. Harris adviſes 2 ſcruples of the ſimple powder of crabs claws, two hours before the fit, and to be repeated in an hour, in mint-water; no ſmall beer is to be drank for eight hours after. It may be repeated in the ſame manner againſt the next time the fit is expected; as likewiſe a third time.

Langriſh aſſerts, that in long continued agues or intermitting fevers, which have baffled the bark and many other medicines, he has met with more advantage from rhubarb and calomel exhibited in ſmall doſes, than from any thing elſe he had tried.

To prevent the return of an ague, the bark muſt be repeated every week or ten days, for three ſeveral times, with the ſame intervals. Likewiſe bitters and chalybeates are very ſerviceable for the ſame purpoſe.

Of the Catarrhal Fever, *or the* Continual Quotidian *of the ancients.*

It generally begins in the evening, with a ſhivering and

and a coldnefs of the extreme parts, efpecially of the feet, and foles of the feet; a coftivenefs; a frequent defire of making water, but the urine is fmall in quantity; a weaknefs of the head, an univerfal languor of the whole body, a falfe appetite, thirft, difficulty of fwallowing, a ftimulus in the larynx; a heat in the noftrils and fauces, attended with fneezing; a weight in the breaft: towards night, heat, and a quicker, fuller pulfe, with a defluxion of rheum, a heat in the fauces, unquiet fleep, a fweating in the morning, a heavinefs and dulnefs of the whole body, and a lofs of appetite.

The immediate caufe of this diforder is a fharp acrid ferum or lympha, fubfifting in the glandulous tunics, and irritating them with pain, tumour, and rednefs. This happens in the whole region of the noftrils, palate, and fauces; as alfo in the afpera arteria, with the bronchial branches; and farther in the oefophagus, ftomach, and inteftines. Hence a hoarfenefs, a cough, a hawking up of vifcid matter, a fneezing, a defluxion of the lungs: likewife a naufea, fometimes a vomiting; a heat about the præcordia; a griping of the guts, followed with a falutary flux.

It more frequently attacks women and children than men, and thofe that indulge themfelves in ftrong liquors. It fometimes happens from the drying up of a fcald head and other eruptions. Sometimes it is epidemical.

This difeafe is moft frequent in the fpring and autumn, in fudden changes of the weather from hot to cold, from dry to moift, and *vice verfa*; as alfo from change of air, if of different qualities; from being expofed to the cold air of the night, and from throwing off winter-garments too foon.

This difeafe is not dangerous in itfelf, if rightly managed, and terminates in feven or fourteen days at fartheft: for the laffitude of the body then difappears; and the other complaints, efpecially the head-ach and hemicrania are appeafed, when the catarrh appears, and there is a plentiful difcharge from the noftrils.

It often goes off, in fome, in the beginning, with an increafed perfpiration or by fweat; in others after a few days, by hawking up a large quantity of vifcid matter, or a plentiful difcharge of a mucous ferum by the nofe; in others, by a loofenefs, when the urine at the fame time, which before was thin and little, becomes copious and heavy, with twice the quantity of fediment as in a natural ftate.

The intentions of cure are three, 1. To fheath the acrimony of the lympha. 2. To increafe perfpiration. 3. To promote the expectoration of the vifcid mucus.

The faline fharpnefs of the lympha may be taken off by the abforbent and diaphoretic powders, humecting and oleous remedies; fuch as, oil of fweet almonds, fperma ceti, milk, cream, almond emulfions, with the addition of white poppy feeds, barley broth, water gruel, chicken broth, with the yolk of an egg; as alfo liquorice-juice, liquorice-tea, dried figs and raifins. If the acrimony is very fubtle and corroding, gentle anodynes fhould take place, fuch as faffron, diacodium, and ftorax pills.

To promote a diaphorefis,

1. Take a fcruple of the powder of contrayerva; Virginian fnake-root and faffron, of each 5 grains. Mix and make them into a powder. To be repeated in 4 or 6 hours, if neceffary.

To appeafe the cough,

2. Take oil of olives, an ounce and a half; pure water, 6 ounces; fpirit of hartfhorn, 40 drops; pectoral fyrup, one ounce. Mix them, and take a fpoonful every four hours.

To promote perfpiration, order tea, with leaves of veronica, hyffop, liquorice-root, elder flowers, wild poppies, and fennel feeds; as alfo the more fixed diaphoretic powders, with antifpafmodic waters; but efpecially bodily motion and exercife.

To promote the excretion of the thick, vifcid mucus, figs and raifins are proper, with brandy burnt, and reduced almoft into a fyrup. Likewife a pectoral elixir, made of gum ammoniac, myrrh, liquorice-root, elecampane-root, faffron, benjamin, and oil of annifeed, whofe virtue may be heightened by the vinous fpirit of fal ammoniac or tincture of tartar. The ftagnating mucus of the nofe may be diffolved by often holding to the nofe the dry volatile fal ammoniac, mixed with a few drops of genuine oil of marjoram.

The regimen fhould be temperate; and cooling things, as well as acids, fhould be avoided.

The aliment fhould be fparing, the drink warm and wholefome; the beft is a decoction of pearl-barley and fhavings of hartfhorn, as alfo water-gruel.

If the body is coftive; befides water-gruel, manna, prunes, and raifins, nothing is better than an emollient clyfter.

In the decline of the difeafe, when the cough is too moift, the defluxion great and obftinate, it will be proper to take a large dofe of manna, to two or three ounces in fennel-water, to carry the humours downward.

When the cough is very violent, it muft be appeafed with a mixture of oil of fweet almonds frefh drawn, and French fyrup of capillaire.

When women labour under a fuppreffion of the menfes, the body muft be kept open with clyfters; bezoardic powders muft be given, and a grain of faffron added to each dofe, or a few grains of flowers of fulphur; but avoid fweet things and expectorants.

When the fever is vanquifhed, and the lungs continue in a lax ftate, which is known from too large a fpitting, to the bezoardic powders muft be added a few grains of cortex eleutheriæ.

In a violent obftinate cough, fweet pectorals, and incraffating remedies too plentifully given, bring on a cachexy, or phthifis, by fpoiling the appetite, and hurting the tone of the lungs. HOFFMAN.

What we commonly call CATCHING COLD, may be cured by lying much in bed; by drinking plentifully of warm fack-whey, with a few drops of fpirit of hartfhorn, poffet-drink, water-gruel, or any other warm fmall liquor; living upon fpoon-meats, pudding, and chicken, and drinking every thing warm: In a word, treat it at firft as a fmall fever, with gentle diaphoretics; and afterwards, if any cough or fpitting fhould remain, by foftening the breaft with a little fugar-candy and oil of fweet almonds, or a folution of gum ammoniac in an ounce of

barley

barley-water to make the expectoration eafy, and afterwards going into the air well cloathed.

Of the Semitertian Fever.

This is an epedemic fever, compounded of an intermitting tertian and a continual quotidian.

It generally makes its onfet before noon, with coldnefs, fhaking, and a contracted pulfe; to which fucceeds a frequent pulfe, with heat, which continues fome hours, till a warm fweat appears, without a complete intermiffion. The heat, after a flight chilnefs, increafes towards night, with a quick pulfe; which is more moderate the next day, without thirft, till the evening, when a flight fhivering comes one, and the fymptoms return. On the third day, the fhaking fit appears again with more intenfe heat, and proceeds in the fame track as before; fo that the fever is never quite off, but has an exacerbation in the evening: however, the fhaking fit is moft confpicuous every third day in the morning.

Befides the foregoing fymptoms, the ftrength fails, the appetite is languid, fleep is wanting, the urine is thin and crude; but after the fit on the third day, it is thick and coloured, and a fmall quantity of crude matter is brought up with coughing. It is fometimes attended with a pain in the back and the abdomen, together with a fwelling in the latter. Some at the accefs of the fit of the tertian, are affected with a naufea and cardialgia. Some vomit, others faint, and others again are delirious.

This fever is generated by all things that render the humours thick and impure, efpecially thofe that fill the primæ viæ, and the veffels of the mefentery, with impurities. Thofe are moft liable to it who live upon fweet, acid, and fermentable aliment, that live an idle fedentary life, that drink lefs than they ought, or love fweet wines; as alfo thofe that give way to fadnefs and melancholy.

It generally terminates either on the ninth or thirteenth day, in health, or another difeafe, or death.

It is a good fign when a fweat breaks out at the decline of the paroxyfm, and when, on the feventh day, being critical, or, after it, the belly is difturbed, and is followed with a flux of a bilious, pituitous, or bloody matter, for it foretels the folution of the difeafe; as alfo when the pains in the belly are very fharp, and grow worfe at certain hours, being followed with a fanious and purulent diarrhœa, or when plenty of black blood comes away.

It is a bad fign, when nothing of this happens: but, on the other hand, a heat about the præcordia, a tenfion and pain in the whole region of the ftomach, a vomiting and hiccup, inquietude, toffing and trembling of the hands, are very ominous, and fhew that the inflammation has reached the ftomach.

The cure is to be performed, 1. By fpeedily difcuffing the inflammatory ftafis in the coats of the inteftines and mefentery, and preventing it from fpreading farther. 2. By correcting and gently evacuating the matter of the intermitting fever.

The firft end may be obtained by diaphoretic powders, mixt with a little nitre, in fmall dofes, but taken often.

Take of fcorzonera root, 2 ounces; fhavings of hartfhorn, and paffular. minor. of each one ounce; of cichory root, half an ounce. Boil the ingredients for half an hour in 8 pounds of water.

To cleanfe the firft paffages, and to carry off the morbid matter, ufe a folution of manna with cream of tartar, raifins, and a little fal polychreft.

Things of this kind cleanfe the inteftinal canal, without raifing a commotion in the blood, without ftimulating the nervous parts, and without finking the fpirits.

Purges in the beginning are unfafe, becaufe the morbific matter is not prepared; but if the body is coftive, it may be opened with an emollient and faponaceous clyfter.

All deterfive falts are improper in this difeafe, except ftibiated nitre and fal polychreft.; for thefe have an aperient, diuretic and laxative virtue, and may be given to 15 grains in a proper vehicle. When this fever is on the decline, and nature feems intent in carrying off the difeafe by ftool, then the above laxative will be proper.

Bleeding will be proper in the very beginning of the difeafe, if the patient is plethoric, the heat urgent, the ftrength not much impaired, and when fome critical hæmorrhage is fuppreffed. All heating medicines are to be avoided, as well as fixt aftringent earthy teftaceous powders; and alfo the bark, unlefs there is a perfect intermiffion; for this laft, as Baglivi obferves, has brought on fatal inflammations, or flow hectic fevers.

Of the Nervous Fever.

In a nervous fever, the patients at firft are fubject to flight tranfient chilneffes often in a day, with uncertain flufhings of heat; they have a liftleffnefs, laffitude, and wearinefs; they are apt to figh, and complain of a heavinefs, dejection, and anxiety, with a load, pain, or giddinefs of the head, with an inclination to yawn and doze; they want appetite, and difrelifh every thing; they have a drynefs of the lips and tongue without any confiderable thirft; they have frequent naufea's, with reaching to vomit: the breathing is difficult by intervals, and efpecially towards night there is an exacerbation of the fymptoms, with a low, quick, unequal pulfe; the urine is pale, and made often and fuddenly; a torpor, or obtufe pain and coldnefs often affect the hind-part of the head, or a heavy pain is felt along the coronary future. Thefe commonly precede fome degree of a delirium.

The countenance is heavy, pale, and dejected: fometimes they are quite wakeful; and when they fall afleep, they are fo infenfible of it, that they difown it.

The pulfe is very remarkable in this difeafe, and requires the moft diligent attention; for it is generally low, quick, and unequal: the inequality confifts in this, that a few pulfations fhall be more fwift, frequent, and large, fometimes fluttering; and then prefently it returns to be low and quick.

The urine has generally no fediment; and when it has, it is like bran; it is fometimes of a whey-colour, or like dead fmall-beer. The drynefs of the tongue feldom appears at the beginning, though it is then fometimes covered with a thin whitifh mucus; but at the clofe of the difeafe, it often appears very dry, red, and chapped.

About the feventh or eighth day the giddinefs, pain, or heavinefs of the head, become much greater, with a con-

ftant

ſtant noiſe in it, or tingling of the ears, which is frequently the forerunner of a delirium.

The load on the præcordia, the anxiety and faintneſs, grow much more urgent; and the patient often falls into an actual deliquium, eſpecially if he attempts to ſit up. Now, cold ſweets appear ſuddenly on the forehead and back of the hands, while the cheeks and palms glow with heat, and as ſuddenly go off. If the urine grows more pale and limpid, a delirium is certainly at hand, with univerſal tremors and *ſubſultus tendinum*; the delirium is generally little more than a confuſion of thought and action, a continual muttering and faultering of ſpeech. Sometimes they awake in a hurry and confuſion, and preſently recollect themſelves, but forthwith fall into a muttering, then doze again.

At the ſtate, the tongue grows often dry, with a yellow liſt on each ſide; and when the patient attempts to put it out, it trembles greatly. If at this time a copious ſpitting comes on, it is a very good ſign. When there is a difficulty of ſwallowing or continual gulping, it is a dangerous ſymptom, eſpecially with a hiccup.

On the ninth, tenth, or twelfth day, the patient often falls into profuſe ſweats, which at the extremities are commonly cold and clammy; and frequently there are thin ſtools, which are generally both colliquative and very weakening. A warm moiſture on the ſkin is reckoned ſalutary; and a gentle diarrhœa often carries off the delirium and ſleepineſs.

When the extremities grow cold, the nails livid, the pulſe exceeding weak and quick, inſomuch that it rather trembles and flutters than beats, or creeps ſurpriſingly ſlow, with frequent intermiſſions; then nature ſinks apace, and the patient becomes quite inſenſible and ſtupid; the delirium turns to a profound coma, which ſoon ends in death; or the ſtools, urine, and tears, run off involuntarily, as a prelude to a ſpeedy diſſolution; or there are vaſt tremblings and twitchings of the nerves and tendons, which terminate in a general convulſion, and this in a ceſſation of all motion. One or other of theſe ways cloſes the ſcene, after the patient has languiſhed fourteen, eighteen, or twenty days, nay, ſometimes much longer.

All perſons grow deaf and ſtupid towards the end of the diſeaſe, and if the deafneſs ends in an impoſthume of the ear, or when a *parotis* ſuppurates, or a large puſtular eruption breaks out about the lips and noſe, they are good ſymptoms.

The cure is to be performed with gentle medicines of the cordial and diaphoretic kind, in order to promote perſpiration; by application of bliſters, and by a proper regimen and method of diet. It will bear no other evacuation than moderate cordial diaphoretics, and bliſters; unleſs a gentle emetic ſhould be indicated in the beginning, or a ſmall doſe of rhubarb when it has continued long. Bleeding is very prejudicial, and much ſweating hurtful. In giving diaphoretics, we ſhould always have regard to the urine; for if that, from being pale, gradually heightens to an amber colour, we are right in our doſe, eſpecially if, when in bed, a gentle dew or moiſture comes on without a reſtleſſneſs; and we muſt always remember, that over-ſweating will raiſe the fever, and endanger the patient.

If the patient is inclinable to deliquia or faintings on every little motion, or complains of greater laſſitude or faintneſs than ordinary, it will be neceſſary that he lie in bed and have bliſters applied; if delirious, the bliſters muſt be laid on high on the nape of the neck.

If reſt is wanted, give a few grains of the *flores martiales*; and if a looſeneſs is not feared, the *flores martiales* may be more freely given.

A vomit ruffles nature much leſs than a common purge, and is neceſſary where a nauſea, load, and ſickneſs of the ſtomach, are urgent. If the body is coſtive, clyſters of milk, ſugar, and ſalt, may be injected with ſafety and advantage every ſecond or third day. The temperate cordial and diaphoretic medicines are certainly moſt proper in theſe fevers; a ſupporting, well regulated, diluting diet is neceſſary, and will go a great way in the cure, eſpecially if aſſiſted by well timed bliſters, and keeping the patient quiet in body and mind. Opiates are commonly very pernicious; mild diaphoretics, as *pulv. contrayerv* compoſ. with a little caſtor and ſaffron, and ſmall quantities of *theriac. androm.* or *elixir paregoricum*, will have much better effects. Where the confuſion or dejection of ſpirits are conſiderable, galbanum or ſylphium, with a little camphire, ſhould be added; and bliſters ſhould be forthwith applied to the neck, occiput, and behind the ears: during all this, a free uſe of thin wine-whey, ſome pleaſant ptiſan, with a little ſoft wine, muſt be indulged. A little chicken-broth alſo is of ſervice, both as food and phyſic, eſpecially towards the decline of the diſorder; and for the ſame reaſon, thin jellies of hartſhorn, ſago, and panada, are uſeful, adding a little wine to them, with juice of Seville oranges or lemons.

It was ſaid above, that profuſe ſweats ſhould never be encouraged; yet the patient is never ſo eaſy as while he is in a gentle, eaſy ſweet, for it ſoon removes the exacerbation of the heat, hurry, &c. when there are irregular partial heats, with great anxiety, reſtleſſneſs, delirium, difficulty of breathing, and a vaſt load and oppreſſion on the præcordia, ſo as to reſemble a peripneumonic caſe: yet beware of bleeding; for the ſmall, low, quick, and unequal pulſe utterly forbids it, as well as pale, watery, limpid urine.

Here then the nervous cordial medicines are indicated, and bliſters to the thighs, legs, and arms.

Take of the compound powder of contrayerva, 15 grains; of Engliſh ſaffron, 3 grains; a ſcruple of the cardiac confection; and a ſufficient quantity of ſyrup of ſaffron to make a bolus.

When great tremors and *ſubſultus tendinum* come on, inſtead of the *pulvis contrayerva*, a ſcruple of muſk may be uſed.

This bolus ſhould be taken every fifth, ſixth, or eighth hour, and a temperate cordial julep may be given now and then out of thin wine or cyder-whey, or, which in many caſes is better, out of thin muſtard-whey.

But this difficulty of breathing, anxiety, and oppreſſion of the præcordia, often precede a miliary eruption on the ſeventh, ninth, or eleventh day, which ſhould be promoted by ſoft, eaſy cordials, proper diluents, ſometimes with a little *theriaca androm.* or *elixir aſthma.* as tending to calm the uneaſineſs, and to promote a diaphoreſis.

In profuſe, colliquative ſweets, give a little generous

red wine, perhaps a little diluted, which moderates the ſweat, ſupports the patient, and keeps up the miliary papillæ.

Towards the decline of the fever, when the ſweets are copious and weakening, give ſmall doſes of the tincture of the bark, with ſaffron and ſnake-root, interpoſing now and then a doſe of rhubarb, to carry off the putrid colluvies, which makes the intermiſſions or remiſſions more diſtinct and manifeſt.

When there is an evident intermiſſion, give preparations of the bark out of draughts made with ſalt of wormwood and juice of lemon. This method will ſhorten theſe fevers, even with miliary eruptions.

Under any evacuations, diluting nouriſhment is abſolutely neceſſary to keep up the ſpirits and repair the loſs of the juices, and the patient ſhould be frequently prompted to take them. When any diſcharges are very immoderate, they may be prudently reſtrained, but not repelled.

Gilchriſt affirms, that to all the warming, attenuating, ſtimulating, or antiſpaſmodic remedies, cinnabar ſhould be added, and that in no ſmall quantity. And he highly recommends the uſe of the bark in the decline of long nervous fevers, or after a remiſſion. And when there is occaſion for bliſtering, he thinks the head moſt preferable whenever it is much affected, though he does not diſapprove the laying bliſters on the back and limbs.

When the low, depreſſing, nervous ſymptoms are ſtronger, the higher methods of ſtimulating are more neceſſary and eaſily borne; in raving, with a low, intermitting pulſe, ſubſultus, fainting, and coldneſs of the extremities, beſides frequent bliſtering, we muſt give camphire and caſtor. The uſes of Virginian ſnake-root, valerian, aſa fœtida, myrrh, and terreous abſorbents, are well enough known, and the forms in which they are given. Refreſhing juleps ſhould not be taken by ſpoonfuls, but by draughts. Acrid cataplaſms may be laid to the feet till they begin to ſtimulate or raiſe a juſt degree of heat: then apply poultices of bread, milk, and vinegar, eſpecially during the exacerbation, to allay the heat and ſtruggle; renewing them alternately, in order to keep up a gentle heat and ſtimulus. A quick, hard, and more contracted pulſe, with ſmart heat, toſſing and anxiety, ſhew it is over-done.

Of Epidemic, Catarrhal, Eruptive Fevers.

These fevers are continual, but not violent: they are attended with a proſtration of ſtrength, watching, loſs of appetite, and are ſometimes joined with an eruption of ſpots on the ſkin, ariſing from the plenty and inteſtine diſſolution of an excrementitious ſerum, not without contagion and danger of life.

Theſe fevers were called by the ancients, *continual, quotidian, ſerous fevers;* and by ſome of the moderns, *malignant catarrhal fevers*, becauſe they are mild at firſt, and attended with a running at the noſe, a catarrh, an infarction of the breaſt, and a cough on the firſt days, with exacerbations at night.

At the beginning of this diſeaſe, the face of the patient has a morbid aſpect, and he is out of order three or four days before he takes to his bed. He complains of a ſpontaneous wearineſs, a grievous pain of his body and joints, as if his bones were bruiſed and broken; his ſtrength is languid, his appetite is loſt, he has a ſlight fainting fit, a cardialgic nauſea, a pain in the head, an unquiet ſleep, with coſtiveneſs. In the evening there is a coldneſs and ſhivering followed by heat, the ſymptoms increaſe, and there is a greater loſs of ſtrength, inſomuch that he can ſcarce ſtand upright. The pain in the head grows worſe, with a giddineſs and inquietude. Some have a violent pain in the back, others in the ſide: they have an anxiety about the præcordia, the internal parts are hot, the fauces dry, the pulſe contracted, quick and weak, the urine is pale without a ſediment, and the breathing difficult.

On the fourth or eleventh day, ſpots appear in ſome, chiefly on the back, breaſt, and arms, with or without relief. Some have more, ſome leſs, of various colours, as purple, a browniſh, livid, or a pale roſe. Theſe are ſometimes broad, ſometimes ſmall; and in many like flea-bites. Theſe different ſpots ſerve to diſtinguiſh the fever by ſeveral names, ſuch as miliary, puncticular, baſtard petechial, and the like.

When this diſeaſe is at its ſtate, or vigor, all the ſymptoms are worſe; the inquietude runs very high, as well as the toſſing of the body with unuſual poſtures. The mind is diſturbed, the ſpeech incoherent, ſleep wanting, the ſweat is coldiſh, with a more intenſe difficulty of breathing, and a contracted, unequal, quick and frequent pulſe, as in the nervous fever.

When a ſubſultus tendinum, want of thirſt, rumbling in the belly, hiccup, an inflamation of the fauces from aphthæ, convulſions, a ſyncope, with coldneſs of the extremities, and a moſt plentiful ſweat, ſupervene to theſe ſymptoms, they are certain forerunners of death. On the other hand, when a ſweat breaks out about or on the critical days, that is, the ſeventh, eleventh, or fourteenth day, and continues ſeveral days, though want of ſtrength remains; or if there is a looſeneſs for ſome days, it is a ſign of health: and this the more certain, if the contracted pulſe enlarges, the hard grows ſoft and becomes more equal; if the patient is more chearful, and his lying in bed more ſedate, with a hardneſs of hearing, and a turbid urine depoſiting a ſediment. If this happens about the critical days, it is a certain ſign of a happy event. After this the ſleep, appetite, and ſtrength, gradually return; but this is ſeldom the caſe before the fourteenth day.

Patients of a ſtrong conſtitution, the common people, and ruſtics, with a good regimen alone, generally ſucceed better than the weak, the timorous, the ſad, the thoughtful, the luxurious, the ſlothful, and the ſtudious. All excretions by urine, ſtool, or ſweat, are bad in the beginning, and on other days except the critical. Thoſe that die are carried off by a phrenſy, or an inflammation of the meninges, or of the œſophagus and fauces from aphthæ of the ſtomach itſelf. If blood is taken away in theſe diſeaſes, it is either of a bright red, very fluid and ſerous, or too thick and blackiſh.

In the cure of this diſeaſe, the phyſician ſhould take care not to diſturb the ſalutary excretions, but proceed cautiouſly, and abſtain from ſtrong medicines of every kind, watching and aſſiſting the motions of nature as much as poſſible. The indications are, 1. To reſtrain and prevent

vent the entire diſſolution of the blood and humours. 2. To temperate and dilute the ſalino-ſulphureous acrimony of the humours, and at the ſame time to keep the fluids fluxile. 3. To promote gently the excretions by ſtool, urine, the ſkin, and ſpittle. 4. To aſſiſt and reſtore the loſt ſtrength.

To prevent the putrid diſſolution of the humours, direct vinegar, the juices of oranges and lemons, and ſyrups of the ſame; ſpirit of vitriol, ſpirit of ſalt, ſpirit of nitre, eſpecially thoſe that are dulcified.

To abate the acrimony, abſorbent, teſtaceous, and bezoardic powders will be proper. To dilute at the ſame time, you may order a decoction of barley with ſcorzonera and ſhavings of hartſhorn; as alſo the ſyrup of orange-juice, chicken-broth, and the like.

To promote the cuticular excretions, give diaphoretic ſimple waters, alexitereal waters, with the tincture of valerian root, or ſnake root. To aſſiſt the excretions by ſtool, common domeſtic clyſters will be uſeful; or thoſe made of a decoction of barley, oil of ſweet almonds, camomile flowers, elder flowers, ſyrup of violets, common ſalt, or nitre.

Or you may order the following laxative, which muſt be given with caution.

Take 2 ounces of manna, a dram of cream of tartar, 3 ounces of ſcorzonera water, half an ounce of ſyrup of violets, 3 drops of oil of juniper. Mix and make them into a draught.

To raiſe the ſpirits and reſtore the ſtrength, a little wine will not be improper, with hartſhorn jellies, China orange or Seville orange juice with ſugar.

A congruous regimen in theſe diſeaſes is of very great conſequence; for if the patient is kept too hot, the diſſolution of the blood will be promoted, a coſtiveneſs will be induced, the anxiety will be increaſed, the impure ſalt and acrid humours will be actuated, the ſtrength will be exhauſted, the ſweating will be too ſpeedy and profuſe, and ſpots will appear on the ſkin. On the other hand, if cold is incautiouſly admitted, eſpecially to the feet, perſpiration will be checked, the eruptions and ſpots will be driven back: There will be griping pains, a looſeneſs, and the critical evacuations will be diſturbed. All ſudden changes from hot to cold, or cold to hot, are equally bad. A temperate regimen is beſt. However, care ſhould be taken that the patient does not breathe his own atmoſphere full of morbid exhalations, ſo very prejudicial to health; but the air ſhould be drawn out of the room, and freſh admitted.

The perſpiration ſhould conſtantly be kept up, and the linen of any kind ſhould not raſhly be changed, nor ſhould the patient be removed from one bed to another. He ſhould be enjoined not to riſe frequently. And if the bed-cloaths are wet and muſt needs be changed, let them be well-aired, and pretty much worn.

An erect poſture of the head and body is to be ſhunned either in or out of bed, eſpecially if the pulſe is very weak and the ſtrength little; as alſo when the diſeaſe is near the ſtate

The mind ſhould be kept as chearful as poſſible, and all occaſions ſhunned of exciting anger, fear, terror, or puſillanimity in the patient. His hope of recovery ſhould be kept up as much as poſſible, inſtead of being terrified with the prediction of death.

It is an undoubted axiom, that all ſtrong medicines are hurtful in this diſeaſe; ſuch as emetics, purgatives, and diuretics; as alſo ſudorifics of too ſpirituous a nature: But temperate and moderate things are very uſeful.

It muſt be remembered likewiſe, that theſe fevers have certain types and periods, and exacerbations and remiſſions at certain times; which a phyſician ſhould always carefully obſerve. In the frebile heat, and when the ſymtoms are moſt intenſe, humectants, diluents, and the abſorbent nitrous powders abovementioned will be moſt proper, with a very moderate external regimen. When the pyroxyſm is ended, the ſkin lax, more ſoft, and diſpoſed for excretions; then analeptics, medicines that ſtimulate; and if there is occaſion, bezoardics, and things that promote perſpiration; as alſo the infuſion of veronica, ſcordium, and liquorice, drank as tea, are likely to do the greateſt ſervice. And becauſe a diarrhœa frequently carries off the diſeaſe, it is never to be ſtopt, eſpecially about the critical times, neither with aſtringents, ſedatives or opiates: But if nature tends to this excretion, and is too ſluggiſh, ſhe is to be aſſiſted by the laxative draught above deſcribed, with the addition of tamarinds.

There is no evacuation ſo dangerous as bleeding at the noſe; for then there is a congeſtion of blood in the head from the ſpaſms of the lower parts. However, if the flux of blood is moderate, and the body abounds with it, inſtead of being hurtful, it will relieve the head, though this ſeldom happens. When there are a few drops only without alleviation, they portend a delirium and an inflammation of the fauces: But when the flux is copious, the ſtrength will diminiſh, and the eruptions return inwards not without danger. Therefore, to prevent a conflux of blood to the head, the feet muſt be always kept in a moderate heat and moiſture; mild bliſters ſhould be laid to the calves of the legs, and the body ſhould be opened with clyſters or ſolutions of manna. Theſe will alſo be ſerviceable when the hæmorrhage is too large. But when it is too little, and the eyes look red and wild, with a ſtrong pulſation of the temporal arteries, beſides the former, it will be proper to apply cupping-glaſſes to the nape of the neck, or to thruſt a ſtraw up the noſe to cauſe it to bleed, or to uſe a ſcarifying inſtrument.

Bleeding in theſe fevers muſt be uſed with great circumſpection; for it is much more proper as a preſervative than a cure. But when the diſeaſe has made its onſet with great loſs of ſtrength, complicated with catarrhal diſorders, and when putrid and malignant fevers are riſe, it muſt be always omitted. If the ſtomach has lately been ſurfeited with incongruous aliment, a grain or two of tartar emetic in a ſolution of manna will be neceſſary. Bliſters will be of great uſe when a retroceſſion of the eruptions is apprehended, when the excretions are ſlow, and when there is a ſleepineſs and torpor; in which caſes, they may be laid to the arms and calves of the legs.

Of the Malignant, Goal, *and* Spotted Fevers.

The true ſpotted fevers are very malignant, contagious, and detrimental to the head and ſtrength, attended with ſpots of various colours, ariſing from a corruption of

of the vital fluids, and a putrid diſſolution conſequent thereupon.

Theſe petechial fevers are deſervedly called malignant, or poiſonous, as they generally proceed from a moſt ſubtile, active, virulent vapour, or miaſma, which is infectious. At firſt they often ſeem mild and gentle, and have the appearance of catarrhal fevers; but they ſoon exert their virulent effects in a moſt fatal manner.

At firſt the patient complains of great weakneſs and loſs of ſtrength, and is apt to faint away.

The head aches, and from the very beginning is hot, dull, attended with a dejection of mind. There is conſtant watchfulneſs; the appetite is loſt; the pulſe is languid, ſmall, and unequal; there is an oppreſſion of the breaſt, ſometimes a dry cough, an undulatory and tremulous twitching of the muſcular and tendinous fibres, with a ſubſultus tendinum. Many neither complain of heat, nor pain, nor anxiety, and aſſert that they feel nothing bad, but weakneſs and want of ſleep. The urine is generally thin at firſt, and like that of ſound people. On the fourth, fifth, or the ſeventh day, the ſpots appear principally on the back and loins, of various colours, generally without relief; wherefore they are rather ſymptomatical than critical.

Huxham ſays, theſe fevers attack with much more violence than the ſlow and nervous; the rigors, if any, are greater, the heats ſharper and more laſting, yet at firſt ſudden, tranſient, and remittent; the pulſe more tenſe or hard, but commonly quick and ſmall, though ſometimes ſlow and ſeemingly regular for a time, and then fluttering and unequal. The head-ach, giddineſs, nauſea, and vomiting, are much more conſiderable, even from the very beginning. Sometimes a ſevere fixed pain is felt in one or both temples, or over one or both eye-brows, frequently in the bottom of the orbit of the eyes. The eyes always appear very full, heavy, yellowiſh, and often a little inflamed. The countenance ſeems bloated, and more dead-coloured than uſual. Commonly the temporal arteries throb much, and a tinnitus aurium is very troubleſome; a ſtrong vibration alſo of the carotid arteries comes on frequently in the advance of the fever, though the pulſe at the wriſt may be ſmall, nay, even low: This is a certain ſign of an impending delirium.

The proſtration of ſpirits, weakneſs, and faintneſs, are often ſurpriſingly great and ſudden; ſometimes, when the pulſe ſeems tolerably ſtrong, the reſpiration is very laborious, and interrupted with a kind of ſighing or ſobbing, and the breath is hot and offenſive.

There is generally a ſort of lumbago, or pain in the back and loins, a wearineſs, ſoreneſs, and pain in the limbs. Sometimes a great heat, load, and pain at the pit of the ſtomach, with a perpetual vomiting of porraceous or black bile, of a nauſeous ſmell, with a troubleſome hiccup.

The tongue at the beginning is white, but grows daily more dark and dry, or of a ſhining, livid colour, with a kind of bubble at the top; ſometimes exceeding black for many days: At the height, it is generally dry, ſtiff, and black, and the ſpeech ſcarcely intelligible.

The thirſt, in the increaſe of the fever, is commonly very great, ſometimes unquenchable; and all the drinks ſeem bitter and maukiſh; at other times there is no thirſt, though the mouth and tongue are exceedingly foul and dry; this is a dangerous ſymptom, and ends in a phrenzy or coma. The lips and teeth, near the ſtate, are furred with a very black tenacious ſordes.

At the onſet of the fever, the urine is often crude, pale, and vapid; but grows to ſo high a colour as to reſemble a ſtrong lixivium, or citron urine, tinged with a very ſmall quantity of blood: it has no ſediment, or cloud, for many days together; but by degrees grows darker, like dead ſtrong beer, and ſmells offenſive.

The ſtools, eſpecially near the ſtate, or in the decline of the fever, are for the moſt part very offenſive, green, livid, or black, frequently with ſevere gripes or blood. When they are more yellow or brown, the leſs is the danger: but the danger is greateſt of all when they come away inſenſibly. If the belly be hard, ſwelled, and tenſe, it is a very bad ſymptom. A gentle diarrhœa is often very beneficial, by which nature carries off the morbific matter.

The more florid the ſpots are, the leſs is the danger; and it is a good ſign, if the black or violet become of a brighter colour. The large, black, or livid ſpots, are almoſt always attended with profuſe bleedings. The ſmall duſky, brown ſpots, like freckles, are almoſt as bad as the livid and black. Sometimes they are attended with profuſe, cold, clammy ſweats; at which time the ſpots vaniſh without any advantage.

The eruption of the ſpots is uncertain; ſometimes they appear on the fourth or fifth day; ſometimes not till the eleventh, or later. The *vibices*, or large livid or dark greeniſh marks, ſeldom appear till very near the fatal period. Sometimes about the eleventh or fourteenth day, when the ſweats are profuſe, the ſpots diſappear, and vaſt quantities of ſmall, white, miliary puſtles break out. If there is an itching, ſmarting, red raſh, it commonly greatly relieves the ſick, as well as large, fretting, watery bladders on the back, breaſt, and ſhoulders. A ſcabby eruption about the lips and noſe is a ſalutary ſymptom; the more hot and angry the better. Brown dark aphthæ are more uncertain and dangerous, as well as thoſe exceeding white and thick like lard. They are followed with difficulty of ſwallowing, pain and ulceration of the fauces and œſophagus, with inceſſant hiccup; the whole *primæ viæ* are at length affected, a bloody dyſentery comes on, and a mortification of the inteſtines.

Pringle obſerves, that in hoſpital, goal, or camp fevers, the firſt complaints are gentle horrors, and little feveriſh heats, alternately ſucceeding each other, with loſs of appetite; the diſorder being greateſt at night, the body is hot, the ſleep interrupted and not refreſhing. They have conſtantly ſome pain and confuſion in the head, chiefly about their forehead; the pulſe is at firſt but little quicker than the natural, and the drought, if any, is inconſiderable. They are too ill to mind buſineſs, and too well to be confined. In this ſtate, a change of air, with a vomit and ſweat, will perform a cure; yet a large bleeding at this time will ſink the pulſe, and bring on a delirium.

When the ſymptoms come on quick and violent, the fever ſeems to be inflamatory, and can only be diſtinguiſhed by a knowledge of the circumſtances; and bleeding yields no

no relief, but exaſperates the complaints. The aforeſaid ſymptoms are now more high, with great laſſitude, nauſea, and pains in the back, with pain and confuſion in the head, and great dejection of ſpirits.

The pulſe at this time is generally quick and full: now a moderate bleeding affects the pulſe but little; if large, it will ſink, and bring on a delirium. The worſt kind of blood is when the craſſamentum is diſſolved, which is a ſign of high putrefaction.

If the patients lie warm, the body is generally coſtive; if cold, there is a diarrhœa. If they have bilious ſtools when they are warm, they are critical, and not to be checked unleſs immoderate. In the worſt kind of theſe fevers, in the laſt ſtage, a diarrhœa commonly carries the patient off; but then the ſtools are involuntary, colliquative, ichorous, or blackiſh, and of a cadaverous ſmell, which are the effects of a mortification in the bowels.

The heat of the body at firſt is not conſiderable: but if the pulſe is felt for a while, there is an uncommon heat, which remains upon the fingers ſome minutes afterwards. A day or two before death, the extremities feel quite cold, and then the pulſe is hardly to be diſtinguiſhed.

The ſkin is generally dry and parched; yet in the beginning there are often imperfect ſweats, without any relief. A continued and generous ſweat is the ſureſt cure.

The tongue is generally dry, hard and black, with deep chaps; but towards the laſt it is ſoft and moiſt, and the colour is a mixture of green and yellow, The drought is ſometimes great, at other times very little.

Some preſerve their ſenſes through the courſe of the diſeaſe, except a confuſion and ſtupor; but few keep them till death, if it prove fatal. They ſleep ſeldom and ſeem to be penſive and in deep thought. The face is not ghaſtly nor morbid, till towards the laſt. The confuſion of the head often riſes to a delirium, eſpecially at night, but ſeldom changes to rage. A tremor is more common than a ſubſultus tendinum. The pulſe ſinks all along, the ſtupor or delirium and tremor increaſe, and the ſpirits are relieved in proportion to its riſing to the head. Frequently the patient is dull of hearing from the very beginning, and at laſt grows almoſt deaf.

When the delirium is at its height, the face is commonly fluſhed, and the eyes red, unleſs after large evacuations; then it appears meagre; the eyelids in ſlumbers are only half ſhut; and the voice, which is conſtantly ſlow and low, ſinks to a degree ſcarce to be heard.

When the fever is protracted with a low pulſe, they have a particular craving for ſomething cordial; and nothing is ſo acceptable as wine. They long for no food; but will take panada, if mixed with wine.

There are ſpots, but not always. In hoſpitals they are leſs uſual at the firſt breaking out of the diſeaſe; but when the air is more corrupted, the ſpots are common. They are of the petechial kind, of an obſcure red, paler than the meaſles, not raiſed above the ſkin, of no regular ſhape, but confluent. Theſe ſpots are very irregular, ſometimes appearing on the fourth or fifth day, and at others on the fourteenth. They are neither critical nor mortal ſigns, but dangerous; if purple, they are more ominous, but not abſolutely mortal. In a few caſes there have been purple ſtreaks and blotches. Theſe ſometimes, as well as the ſpots, do not appear till after death. This fever, on account of its exacerbations at night, may be looked upon as the loweſt degree of the remitting kind.

The duration is uncertain, and in proportion to the virulence. Their courſe is generally from fourteen to twenty days: ſome have died or recovered after four weeks. When the courſe is long, it commonly terminates in abſceſſes of the parotid or axillary glands, ſometimes in an hectic: Some, after this fever is over, fall into an irregular intermittent; many complain of a pain in their limbs, and want of reſt; and almoſt all of great weakneſs, confuſion in their heads, and noiſe in their ears. When the air is highly malignant, the diſeaſe terminates, in five or ſix days, either in death or a critical ſweat.

The moſt peculiar ſymptoms of this diſeaſe, are always a ſingular attack upon the head, as a ſtupor, or pain; and if it lingers, a ſlow low voice, and ſinking of the ſpirits, without any large evacuation; pale urine, petechial ſpots, the bad effects of large bleeding, or too many clyſters; laſtly, the diſagreement of cooling medicines, excepting in the beginning; and on the other hand, the agreement with wine, volatiles, and other cordials, during the greateſt part of the diſeaſe.

As to the prognoſtics, the ſpots are ſo far from being ſalutary, that the more plentiful they are the greater is the degree of the corruption: when they are livid, lead-coloured, and of a greeniſh black, they ſhew a ſphacelous corruption. Thoſe who eſcape are not freed by a cutaneous excretion, but by large ſweats, breathing a ſtinking acor; or by critical fluxes of the belly; which happen by the benefit of nature, when the corruption of the fluids is not great. Many are apt to fall into a ſphacelous corruption of the ſtomach, inteſtines, and other viſcera, or into a phrenſy, or more frequently into an anginous inflammation of the fauces and œſophagus, as appears from the intolerable ſmell which happens after death. This unhappy event is preſaged, if there is no thirſt, or one that is unquenchable; if the tongue is dry, chapt, black; the fauces inflamed and beſet with ſordes, with difficult ſwallowing; if, after the eruption of the ſpots, a difficult breathing and ſtraitneſs of the breaſt remains and gains ground; or if a delirium increaſes after ſweating, and a flux of the belly, the urine being at the ſame time turbid, and depoſiting no ſediments; laſtly, if the eyes are dim, the patient catching at ſtraws; if there is a ſubſultus tendinum, if the excrements come away inſenſibly, or if there is a cold ſweat with convulſions,

Pringle obſerves, that thoſe who are weakened by other diſtempers, or their cures, are more ſuſceptible of the goal or hoſpital fevers than the ſtrong and vigorous; and that one who is recovered is more ſubject to relapſe, than he who is to be firſt attacked.

All the prognoſtics, ſays he, taken ſingly, are uncertain. The following ſigns are good: to have no delirium; to have the pulſe neither very low nor quick, or, if ſunk, to have it riſe by wine or cordials, with an abatement of the delirium; and to have the tongue moiſt, and of a natural colour. It ſeems peculiar to this fever, that deafneſs is generally a good ſign. The natural and beſt criſis is by ſweat, when the pulſe riſes, and the ſymp-

toms abate; next to that is an inſenſible perſpiration, which is known by the ſoftneſs of the ſkin, moiſture of the tongue, and a remiſſion of the other ſymptoms. Bilious ſtools, with turbid urine, and a moiſt tongue, may be conſidered as ſigns of a favourable criſis. But the contrary of all theſe are bad; as alſo the ſubſultus tendinum, inflamed eyes, and great anxiety. It is obſerved to be among the worſt ſigns, when the patient complains of blindneſs, or when he cannot lie but on his back, and pulls up his knees; or if, when inſenſible, he endeavours to uncover his breaſt, or makes frequent attempts to get out of bed. If there are ichorous, cadaverous, and involuntary ſtools, it is a ſign of certain death.

The formal ratio of theſe pernicious fevers, conſiſts in the putrid diſſolution or colliquation of the blood and vital fluids, eſpecially of that highly elaſtic fine fluid which is contained in the blood, and ſeparated in the brain and ſpinal marrow, by which it is diſtributed by the nerves to all the body, indued with ſenſe and motion, for it greatly vitiates and defiles this liquid. However, ſuch is the nature and power of that poiſonous vapour, by which ſound bodies are infected, that it not only induces a putrid fermentation into the blood and other fluids, but acts immediately on the inward and nervous parts of the brain, which it corrupts, and produces a languor in the vital and animal powers, even while the ſtate of the blood and humours remain free from corruption.

This virulent vapour enters the body by the noſtrils, fauces, and bronchia; whence it immediately reaches the nerves in the brain, and renders the patient light-headed, with a dulneſs of the head, and a loſs of ſtrength, and a vertiginous affection. It likewiſe mixes with the ſaliva, deſcends into the ſtomach, which is a nervous part, and there takes up its principal reſidence: whence the bad ſymptoms generally appear firſt in the ſtomach and præcordia, with a nauſea and an inclination to vomit, as alſo a diarrhœa with gripes, or a coſtiveneſs, with loathing of food, anxiety of the præcordia, and watery eructations from the ſtomach.

Hence the reaſon evidently appears, why nothing is more proper to guard againſt this diſeaſe than turning away one's face from the patient, frequent ſpitting, chewing angelica, zedoary, or pimpernel, and ſmoaking tobacco: hence likewiſe appears, why the force of this poiſon is exerted in the ſtomach, which is beſet with copious crudities, and pituitous and ſalival ſordes; and likewiſe why gentle emetics, joined to alexipharmics, commonly deſtroy the diſeaſe in the bud.

It may be induced by a bad ſtate of the air: for a long moiſt, rainy, cloudy, and ſoutherly ſtate of the air, dulls and depreſſes the motions of the ſolids and fluids neceſſary for life: to this may be added a long and frequent inundation of water, which is apt to generate putrid diſeaſes; as likewiſe the exhalations ariſing from putrid unburied bodies, or from the excrements of animals, eſpecially if confined and ſhut up from the air.

In the regimen, it is neceſſary, if poſſible, to breathe a ſerene, temperately warm air. The room ſhould not be heated too much, it being found to be hurtful. The patient ſhould eat nothing ſolid in the decline of the diſeaſe, nor after it. A free uſe of food, of nouriſhing and comforting broths abounding with oleous particles is pernicious, eſpecially about the critical days, in the ſtate of the diſeaſe, or where there is any critical evacuation. Nothing is more hurtful than an erect ſituation.

Alexipharmics, volatile ſalts, hot and ſpiritous bezoardics, are hurtful, eſpecially with a hot regimen: for they diſſolve the blood, and increaſe the number of ſpots; or cauſe head-achs, inflammations, or copious ſweats.

Bleeding has been good in plethoric bodies, and in thoſe who have been accuſtomed to hæmorrhages; on the contrary, if the patient is low or weak, bleeding is hurtful.

Gentle vomits are uſeful by way of prevention, and in the very beginning of the diſeaſe; but in the progreſs and ſtate have had a bad effect.

Bliſters have been greatly praiſed in the ſtate of the diſeaſe, when there has been a delirium, a ſopor and convulſions, being applied to the neck.

We reject all opiates and ſoporiferous medicines, on account of the pulſe and want of ſtrength; becauſe they retard the excretions, increaſe the malignity, and ſo haſten death.

The medicines uſed are elder-flower water, that of limes, elms, roſes, of the tops of ſcordium, ſcabious, and carduus benedictus; as alſo ſyrups of citrons, pomegranates, and the juice of roſes; powders of mother of pearl, diaphoretic antimony, crabs-eyes, amber, terra ſigillata, burnt hartſhorn, pure nitre. Alexipharmics are, camphire, eſſence and extract of ſcordium, vincetoxicum, the bezoardic ſpirit and tincture, the eſſence or ſpirit of vitriol, and dulcified ſpirit of nitre: Moiſteners, the decoction of ſcorzonera, ſhavings and jelly of hartſhorn: Analeptics, orange-flower water, freſh oil of citrons, with ſugar, confection of alkermes, and balſam of life: Antiſpaſmodics, eſſence of caſtor, cinabbar, and ſuccinated ſpirit of hatſhorn.

In the beginning of the diſeaſe, uſe a bezoardic powder of nitre, and a little camphire, often repeated; in the progreſs and ſtate of it, a mixture of temperate waters, diaphoretics, analeptics, antiſpaſmodics, and cordial bezoardic powders, with a little juice of citrons. In the drink put nitre, or philoſophic ſpirit of vitriol, or ſulphurated clyſſus of antimony, to keep the body open. Alſo give drink of the filtrated decoction of hartſhorn, and root of ſcorzonera, either hot or cold. About the critical day give gentle alexipharmics, with things to promote ſweat when nature ſeems to tend that way.

This is the beſt and ſureſt method of cure. But if the vomiting is too great, with an anxiety of the præcordia, and profuſe diarrhœas, accompanied with gripes, apply outwardly Venice treacle, expreſſed oil of nutmegs, camphire, oil of cloves, and balſam of Peru, mixt together, to the region of the ſtomach. If a diarrhœa exhauſts the patient too much, give a nitrous bezoardic powder, with a little camphire, and theriaca cœleſtis. If the body is coſtive, with gripes, preſcribe lenient clyſters, or ſuch as are made entirely of oil. To raiſe the ſtrength, allow ſpiritous things, ſuch as comfort and are aromatic; but they muſt be externally applied to the pulſes or pit of the ſtomach, or noſtrils. To quench thirſt, give an electuary of Muſcovada ſugar and dulcified ſpirit of nitre.

Nature

Nature many times ſtrives in vain to diſcharge the irritating matter, by vomit, without the aſſiſtance of art; and therefore ſomething to promote it will render it much eaſier; which may be done by an infuſion or decoction of ipecacuanha, or oxymel ſcilliticum, with a ſlight infuſion of camomile flowers.

The primæ viæ ſhould be unloaded by very gentle methods, ſuch as clyſters of milk, ſugar and ſalt; laxatives of manna, cream of tartar; Glauber's purging ſalt, tamarinds, and rhubarb.

When there are ſigns of redundancy of the bile, it ſhould be forthwith diſcharged by vomit or ſtool, as nature points out; which is often ſucceeded by an amazing change for the better, where an inexpreſſible anxiety, load on the præcordia, perpetual ſickneſs, eructation, and ſingultus, had preceded.

Between the ſeventh and fourteenth day, nature endeavours to relieve herſelf by vomit, or more frequently by looſe ſtools; then given a gentle laxative the eighth and ninth day, unleſs ſome eruption appear, or a kindly ſweat forbid it.

But the conſtant and grand effort of nature, is to throw off the putrid malignancy through the pores of the ſkin. If it be a breathing ſweat at the ſtate of the diſeaſe, and the pulſe grows more open, ſoft, and calm, a little before and during its continuance, it is always ſalutary; but if it be profuſe, cold, clammy, or partial, about the head and breaſt only, the ſign is not good. Profuſe ſweats in the beginning are generally pernicious, eſpecially if a *rigor* ſupervenes.

Sweats ſhould never be forced by violent hot medicines, regimen, *&c.* Plentiful ſubacid diluents will be ſufficient, and gentle cordial diaphoretics.

As acids and ſubaſtringents are given to preſerve the craſis of the blood and tone of the veſſels, and to prevent the farther putrefaction of the humours, diaphoretics, eſpecially camphire, ſhould be joined with them.

Dr Brookes uſed the following preſcription of the bark for many years with ſucceſs, not only in intermittent and ſlow nervous fevers, but alſo in the putrid, peſtilential and petechial, in the decline, though the remiſſions have been very obſcure; but if the patient is coſtive, or hath a tenſe or tumid abdomen, he premiſed a doſe of rhubarb, manna, or the like.

Take two ounces of Peruvian bark in powder, an ounce and a half of orange-ſkin, 3 drams of Virginian ſnake-root, 4 ſcruples of Engliſh ſaffron, 2 ſcruples of cochineal, and 20 ounces of ſpirit of wine. Mix and infuſe the ingredients in a cloſe veſſel for three or four days, and then filtrate the infuſion.

Of this give from a dram to half an ounce every fourth, ſixth, or eighth hour, with ten, fifteen, or twenty drops of elixir of vitriol, out of any appropriated draught, or diluted wine. The above compoſition tends to ſtrengthen the ſolids, to prevent the farther diſſolution and corruption of the blood, and in the event to reſtore its craſis.

With this view alſo give a generous red wine, as a moſt noble, natural, ſubaſtringent cordial, which is of high ſervice in the ſtate, but more eſpecially in the decline of theſe fevers, acidulated with the juice of Seville oranges or lemons, as alſo with cinnamon, the rind of Seville oranges, and the like, to which a few drops of elixir of vitriol may be added. Rheniſh and French white wines, when diluted, are alſo a moſt ſalutary drink, and generous cyder is little inferior to either.

Of the Pestilential Fever.

A peſtilential fever is a moſt acute one, ariſing from a poiſonous miaſma, brought from eaſtern countries; and unleſs it is immediately expelled out of the body, by the ſtrength of the vital motions, by buboes and carbuncles, it is fatal.

It differs from other contagious, malignant, and eruptive fevers, becauſe it is the moſt acute; for it ſometimes kills on the firſt, and ſometimes on the ſecond day. Beſides, in our climate it is not epidemic or ſporadic, from a bad way of living, or unhealthful air; but happens when it is moſt ſalutary, from contagion alone. There is ſomething very ſingular in this infectious miaſma; for though it is apt to ſpread at a ſtrange rate, yet it will abate by intenſe cold, and be plainly extinguiſhed: wherefore in a cold ſeaſon, and very cold countries, it either does not appear at all, or in a very mild degree; whereas if the climate is hot, it is not only moſt vehement, but moſt common.

In this, as in all other contagious diſeaſes, the venomous miaſma is ſwallowed in with the air, and inſinuates itſelf in the ſalival juice, where its tragedy is firſt acted. Whence it aſſaults the head, brain, nerves, and animal ſpirits, producing a torpor in the head, a heavineſs, a ſleepineſs, a violent pain, a ſtupor of the ſenſes, a forgetfulneſs, inquietude, watching, and loſs of ſtrength. From the fauces it proceeds to the ſtomach, creating loathing of food, nauſea, anxiety of the præcordia, a cardialgia, attended with fainting, reaching to vomit, and vomiting itſelf. Hence it proceeds to the membranes of the ſpinal marrow, and the coats of the arteries, producing horrors, a languid, ſmall, contracted, quick pulſe, and even fainting. All theſe are generally ſigns and ſymptoms of the plague; which are of a more violent and quick operation, in proportion to the virulence of the peſtilential miaſma.

All plagues are not of the ſame nature, but vary according to different conſtitutions and circumſtances. Thoſe who have written of the plague univerſally agree, that ſpungy and porous bodies of an obeſe habit, of ſanguine and phlegmatico-ſanguine conſtitutions; women, young perſons, and children; perſons of a timid diſpoſition, that are poor, live hard, or are given to luxury, and ſit up late at nights: are more apt to be afflicted with this diſeaſe, than the ſtrong and intrepid, lean, nervous; thoſe indued with large veſſels; men, or old perſons obnoxious to the hæmorrhoidal flux, and who have iſſues and open ulcers. Nothing brings on this diſtemper more than fear, dread of death, and a conſternation of the mind.

Peſtilential fevers are ſo called, when the patient falls into ſudden weakneſs: for it is a kind of malignant fever, attended with more grievous ſymptoms; the patients die in a ſhort time, that is, in two, three, or four days, and ſometimes ſooner. If malignant fevers ariſe in war-time among

among the soldiers, they are called camp-fevers; in Hungary, an Hungaric fever. But the plague, or pestilence, is known when buboes and carbuncles arise in various parts of the body. The sweating sickness had its rise in England, in which the patient fell into a violent sweat, of which many died in a day's time.

The pestilential poison disturbs all the functions of the body; for unless it be expelled to the external parts, it is certainly fatal. Nor is this to be done as in other fevers, by large sweats, by stools, by a flux of urine, by customary evacuations of blood, or by bleeding at the nose, either natural or artificial, for they rather hasten destruction. The salutary and critical excretion which perfectly solves the pestilential disease, is by tumours in the surface of the body not otherwise than the erysipelas, between the third and fourth day; and the sooner the better, for then the symptoms are mitigated. The pestilential tumours are of two kinds; the first arises in glandulous places, most commonly in the groin and arm-pits, sometimes in the parotid and mammary glands, as also the lower maxillary, under the chin, and in those near the aspera arteria. It is a hard, painful, tensive swelling of the glands, with great heat; and if they are salutary, being swoln, they grow soft, and suppurate. The other sort is the anthrax or carbuncle. Celsus describes it in this manner. It is a swelling on which there are pustules, which rise but little; they are black, sometimes sublivid or pale. In this there seems to be a sanies; it is black underneath. The body itself is more dry and harder than usual. There is as it were a crust about it, surrounded with an inflammation; nor can the skin be raised up in the part, but is joined to the flesh underneath. Mindererus, who was present at the plague, says, that a carbuncle is of the size of a grain of mustard-seed; and about its edge, there is a circle, or burning halo, of a large size. The flesh which it seizes is like an eschar or putrid flesh, and falls off as if torn out by a wolf. No part of the body is free from these carbuncles; but they generally lay hold of the membranes of the muscles, and the nervous and fibrous substance of the skin, especially in the back, arms, and thighs. At first there is an exquisite itching in the part; which when scratched, pustules arise; they are of a red, livid, or whitish purple colour, or sometimes black. When the pustules are pressed, they seem to be full of pus; under which there is an ash-coloured crust, which being taken away, the flesh appears corrupted and spungy, with intolerable pain and burning of the circumjacent flesh, which is followed by a mortification of the part.

When the plague is fatal, some die of a fainting the first or second day. But in many, when the poison is not expelled, or, if expelled, returns back, it brings on a mortification of the nervous coats of the noble parts, of the pleura, oesophagus, stomach and intestines, or the meninges of the brain; which creeps speedily to all the viscera, and the blood itself; whence the carcases swell, and have a most intolerable stench. Sometimes, when the pestilential tumours are too plentiful, they die of a symptomatic fever, from the inflammation, pain, and intolerable heat.

It has been before remarked, that the plague is not a native of our country, but is brought from remote places: whence the best preservative is to fly to a distant country; for the same reason, those princes best consult the welfare of their subjects, who in the time of the plague endeavour to prevent the spreading of the infection, and, when a family is afflicted, separate the well from the sick, and burn all their moveables. While this disease reigns, all persons should live temperately, avoid an excess in the use of the non-naturals, and abstain particularly from violent affections of the mind, and every thing else that dejects the strength, disturbs perspiration, and generates crudities in the primæ viæ; the mind is especially to be supported, and fear, dread, and pusillanimity are to be banished; for more die of terror than of the plague itself.

As in the small-pox, the management consists in clearing the *primæ viæ* in the beginning, in regulating the fever, and in promoting the natural discharges; so in the plague, the same indications will take place. In the plague, indeed, the fever is often much more acute; the stomach and bowels are sometimes inflamed, and the eruptions require external applications, which to the pustules of the small pox are not necessary.

When the fever is very acute, a cool regimen is necessary; but when the pulse is languid, and the heat not excessive, moderate cordials must be used. The most gentle emetics may be given; the best is ipecacuanha, if the stomach or bowels are not inflamed, for then certain death must be expected.

As for the eruptions, they must be brought to a suppuration as soon as possible; and as soon as they appear, fix a cupping-glass thereon, without scarification; and when that is removed, apply a suppurating cataplasm, or plaster of warm gums.

If the tumors will not suppurate, as the carbuncle seldom or never does; yet if a thin ichor or matter exsudes through the pores, or if the tumours feel soft to the touch, or, lastly, if it has a black crust upon it, then it must be opened by incision, either according to the length of the tumor, or by a crucial section. If there is any part mortified, as is usual in the carbuncle, it must be scarified. Then it will be necessary to stop the bleeding, and dry up the moisture with an actual cautery, dressing the wound afterwards with dossils and pledgits, spread with a common digestive.

The next day the wound ought to be well bathed with a fomentation of warm aromatic plants, with spirit of wine in it, in order, if possible, to make it digest, by which the sloughs will separate. After this, the ulcer may be treated as one from a common abscess.

But the patient runs great hazard in this way, notwithstanding the utmost care; therefore artificial discharges for the corrupt humours should be attempted. To this purpose, large bleeding and profuse sweating are recommended to us upon some experience.

As for sweating, as Sydenham advises, it must be continued without intermission.

If there is a vomiting, the patient should be made to sweat with the weight of the bedcloaths alone, drawing the sheet up to his face.

When the sweat is begun, it should be promoted with sage posset-drink, or small-beer, in which mace has been boiled,

boiled, repeating them pretty often for twenty-four hours; in the mean while, the ſpirits of the patient are to be kept up with comforting broths. The by-ſtanders ſhould forbear to wipe off the ſweat, nor ſhould the patient change his linen all that time, which is a neceſſary caution; if it be ſtopped before that time, it will be to no manner of purpoſe; during the ſweat, the diarrhœa, if any, and the vomiting, will ſtop of their own accord.

Theriaca, and the like ſolid medicines, being offenſive to the ſtomach, are not the moſt proper ſudorifics. An infuſion of Virginia ſnake-root, in boiling water, or, for want of this, of ſome other warm aromatic, with the addition of about a fourth part of aqua theriacalis, is ſafer.

Thoſe who are obliged to be near the ſick, muſt take care that the miaſmata do not approach their vital juices, nor yet the ſalival. To this purpoſe, frequent ſpitting, and waſhing the mouth with vinegar, or wine, or ſnuffing them up the noſe, are uſeful. The efficacy will be ſtill greater, if they are imbued with rue or citron rind. For an acid is the genuine antidote of a putrid and ſulphureous miaſma. Wherefore it is much ſafer to hold acids in the mouth, than alexipharmic roots. It will be likewiſe proper to get a few ſpoonfuls of Rheniſh wine, or bezoardic vinegar, diluted with water or wine, and ſo take them, The Turks deal much in the juice of lemons.

When the plague is actually begun, and the body is coſtive, a gentle clyſter ſhould be uſed. Then a ſweat ſhould be promoted (twenty-four hours at leaſt,) that the poiſon may exhale and paſs through the ſkin; and epithems to the heart will not be without benefit, though they reach only to the right orifice of the ſtomach, and its nervous coats; they may be made of *theriac.* expreſsed oil of nutmegs, camphire, ſaffron, caſtor, and balſam of Peru. But above all, acids are highly praiſed; ſuch as, juice of citrons, Seville oranges, lemons, vinegar, *&c.* which reſiſt poiſon, putrefaction, and prevent the diſſolution of the blood.

When the ſtrength of the diſeaſe is vanquiſhed, gentle laxatives will be proper to expel the ſordes during the courſe of this diſeaſe.

It is worthy obſervation, that few medicines are beſt; for which reaſon people of the lower claſs generally come off better than perſons of diſtinction; and there is nothing worſe than to give alexipharmics abounding with a hot volatile oil; much leſs ought volatile ſpirits to be given, for they fix the poiſon upon the nervous parts. Yet herbs and roots of this kind are not altogether to be condemned, if mixed with acids and nitre. A mixture of *carduus benedictus* water, and wine vinegar, when given to four ſpoonfuls, with a dram of crabs-eyes and theriaca, and repeated, were very uſeful in the plague at Hall in 1682. In the plague likewiſe in Lombardy, 1526, many recovered with the juice of goats-rue, vinegar, water of *carduus benedictus,* and a little *theriac.* given to make the patient ſweat: and Thoner obſerves, that nothing was of any advantage in the plague except theriacal vinegar given in the beginning to promote a ſweat. And in the year 1544, when a malignant fever raged among the ſoldiers, a whole regiment was ſaved, to whom this vinegar was given in due time, except a very few. And in the plague at Rome, vinegar with rue, pimpernal root, betony, garlick, and juniper-berries, with a little camphire added to the infuſion, cauſed many to eſcape. Likewiſe the preſervative water of Sylvius has been greatly eſteemed, becauſe of the vinegar. And Mindererus aſſerts, that unleſs alexiterials be given within twenty-four hours, all medicines are vain.

Of the Miliary Fever.

A miliary fever is not unlike a cattarrhal, and is attended with a more intenſe motion of the vaſcular and nervous ſyſtem, whereby a corrupt lymphatic matter of a peculiar nature is expelled from the inward, and more eſpecially the nervous parts, to the ſurface of the ſkin, in the form of ſmall, rough, miliary puſtules, ſometimes red, and ſometimes white.

Theſe ſmall puſtules are exceeding numerous, cauſing a corrugation, roughneſs, and dryneſs of the ſkin, and have a fetid ſmell peculiar to themſelves. There is no eruption ſo inconſtant as this, for it will ſometimes ſtrike in ſuddenly, and as ſuddenly appear again, and is attended with an itching pricking ſenſation more than any other kind. Other eruptions are common to all countries, and are equally vexatious to men as well as women; but the miliary ſeems familiar and endemic to ſome places only, and more frequently attacks the female ſex, eſpecially in child-bed. It is neither epidemic nor contagious; and ſeems rather owing to a fault in the viſcera and fluids, than the intemperature of the air.

The miliary eruptions are either red or white, and are both more or leſs acute, benign or malignant. The red are leſs dangerous, are generally free from a fever, and then are chronical, appearing at ſtated ſeaſons of the year; but ſometimes they are accompanied with an acute fever. The white ſeldom or never appear without a fever, and therefore are more dangerous. In theſe the lympha is affected with a kind of acidity; for the patient diſcharges plenty of ſerum by ſweat, urine, ſtool or ſalivation, which are the effects of an acid which coagulates the thicker part of the blood, and ſeparates the ſerum from it. Beſides, all kinds of acids and refrigerants, not excepting nitre, freely taken, are moſt hurtful in this diſeaſe. On the contrary, abſorbents and anti-acids, and things which render the blood ſpiritous, are moſt ſalutary. Women who eat much fruit, and ſuch like traſh, of the aceſcent kind, and live idle ſedentary lives, are moſt ſubject to this diſeaſe.

Sometimes the miliary eruptions are idiopathic, and ſometimes ſymptomatic, and ſupervene to other fevers, eſpecially the continual, when on the decline. They likewiſe appear very commonly with the meaſles, ſmall-pox, putrid and ſpotted fevers, when drawing towards an end; and then they raiſe a new fever, whoſe attack the debilitated patient is not able to ſtand.

The idiopathic begins with a ſlight ſhivering, ſucceeded with heat and loſs of ſtrength, ſometimes even to fainting. There is a ſtraitneſs about the breaſt, attended with anxiety and deep ſighs, reſtleſſneſs and watching. There is a pricking kind of a heat perceived in the back, with an alternate ſucceſſion of cold, ſhivering, and heat under the ſkin, but moſt ſenſible in the palms of the hands.

hands. Women in child-bed have the flux of the lochia ſtopped, and the milk recedes from their breaſts. To theſe ſucceeds a roughneſs of the ſkin like that of a gooſe; and a great number of puſtules appear, ſometimes white and ſometimes red, or both together, of the ſize of millet (or muſtard) ſeed They firſt beſet the neck, then the breaſt and back, and afterwards the arms and hands. When theſe begin to riſe on the ſurface of the ſkin, the more grievous ſymptoms ceaſe. The pulſe, which before was hard, contracted and quick, grows more ſoft, free, and ſlow; the dejection of mind goes off, the ſkin becomes moiſt, and the belly, which was bound ſo much that the patient could not break wind, now ſpontaneouſly admits him to go to ſtool. Afterwards the puſtules ripen, and are full of a ſtinking ichor. The urine appears more ſaturated, and a ſingular fetid ſweat, proper to this diſeaſe, breaks forth; the flux of the lochia in females returns, and within the ſpace of ſeven or eight days the puſtules diſappear, with great itching in the extreme parts, drying up and falling off in ſcales. Then the patient recovers ſtrength, and regains health.

It is hard to determine the day of the eruption of the puſtules; but it is generally the tenth or eleventh day from the beginning, if the fever makes a regular progreſs; ſometimes on the eighteenth, and ſometimes on the twenty-firſt, or twenty-ſecond day.

Bad ſigns are, when the miliary puſtules appear and vaniſh by turns, and the ſymptoms continue violent; but it is worſe if they quite diſappear: Hence an oppreſſion of the breaſt, with ſighs, a ſtraitneſs of the fauces, loſs of ſtrength, and great anxiety.

Fatal ſigns are, when the morbific matter not being thrown out again, there is an inward heat and the extreme parts are affected with cold and ſhivering, and there is a cold profuſe ſweat; or, on the contrary, when the extreme parts are hot, and a notable ſenſe of coldneſs is perceived in the abdomen, then the patient dies in a fainting fit, ariſing from a mortification of the ſtomach, inteſtines, brain, or womb.

The cure of this fever depends on the following things. 1. To correct and temperate the acrid morbific matter which diſturbs the nervous parts. 2. To relax the ſpaſtic ſtrictures of the nervous fibres proceeding from thence. 3. To evacuate the prepared morbific matter through the pores of the ſkin, and prevent its ſtriking in.

To dilute the ſharpneſs of the humours, and to appeaſe the irritation of the nervous parts, the following decoction may ſerve for common drink.

> Take ſhavings of hartſhorn, ſcorzonera root, and ſarſaparilla, of each two ounces; and boil them in 6 pounds of water.

Let the patient be always kept in an equal moderate heat, and abſtain from ſtrong alexipharmics, and things actually hot, becauſe they throw him into too profuſe a ſweat. But when there is an apprehenſion of the puſtules ſtriking in, then the decoction may be drank hot, with moderate expellents, as the exigence requires. Nor ſhould the medicines be too cooling, becauſe they increaſe the anxiety and faintneſs. In the red ſort, when there is an internal heat, with thirſt and a great pulſe, diaphoretics with a little nitre will be proper; even though red and white puſtules appear together. But nitre alone ſhould be uſed with caution, eſpecially when there are ſigns of malignity. No malt liquor ſhould be drank, but the former decoction.

The belly ſhould be neither too much bound nor too open; yet even the gentle laxatives are not to be given till the puſtules begin to dry; and then there is nothing elſe required but an emollient clyſter

Bleeding ſhould be cautiouſly uſed; for when the weakneſs is exceſſive, the ſweats profuſe, and the pulſe quick, it muſt be omitted. On the contrary, it is neceſſary for childbed women, when the lochia are ſuppreſſed, and the ſymptoms of a miliary fever begin to appear; but then it muſt be done ſpeedily, and the great anxiety, fainting, and difficulty of breathing will ceaſe, and the puſtules break out.

Bliſters on the back are very proper for this diſeaſe; for they help to draw off the impure ſerous humours, and ſtimulate the fatigued nervous fibres to a contraction, ſo as to expel the morbific matter.

Of the Scarlet Fever.

The ſcarlet fever may happen at any ſeaſon of the year, but it appears moſt commonly towards autumn. It reigns chiefly among children. It begins with coldneſs and ſhivering, as in other fevers, without any violent ſickneſs. Afterwards the ſkin is covered with red ſpots, which are larger, more florid, and not ſo uniform as the meaſles. The redneſs remains two or three days, and then diſappears; then the cuticle falls off, and leaves behind it a ſort of meally ſcales, ſcattered over the body, which appear and diſappear two or three times.

Let the patient abſtain from fleſh, all hot cordials, and ſpiritous liquors; let him not go out of doors, nor be confined conſtantly to his bed; and then medicines will be of little uſe.

Apply a bliſtering plaiſter to the neck, and every night give a paregoric of diacodium; and after the fever ceaſes, let the patient be purged with a very gentle cathartic, agreeable to the age and conſtitution.

Of the Measles.

The meaſles are an eruptive catarrhal fever, generally epidemic, which by the increaſed vital motion of the heart and arteries throws on the ſkin an acrid, cauſtic, inflammatory matter, in the form of red ſpots. They begin with chilneſs and ſhivering, and heat and cold ſucceed by turns. The next day the fever comes on with great ſickneſs, thirſt, and loſs of appetite; the tongue is white, but not dry. There is a little cough, a heavineſs of the head and eyes, and a continual ſleepineſs. There is a ſneezing and a ſwelling of the eye-lids, a ſerous humour oft diſtils from the noſe and eyes, which are certain ſigns the eruption is at hand. In the face the ſpots are ſmall; but on the breaſt broad and red, not riſing above the ſurface of the ſkin. The patient often has a looſeneſs, with greeniſh ſtools.

Theſe ſymptoms continue and increaſe till the fourth, ſometimes the fifth day; at which time ſpots like flea-bites appear, increaſing in number and magnitude, and in ſome places run together, rendering the face variouſly ſpotted.

ſpotted. Theſe ſpots conſiſt of very ſmall red pimples, almoſt contiguous, and riſing but little above the ſkin. They may be felt by a gentle touch of the finger, but the riſing cannot eaſily be diſcerned by the naked eye.

From the face the ſpots gradually proceed to the breaſt, belly, thighs, and legs. The ſymptoms do not immediately vaniſh after the eruption, as in the ſmall-pox, except the vomiting. The cough and fever increaſe, with difficulty of breathing. The weakneſs, and a defluxion on the eyes, ſleepineſs, and want of appetite, ſtill continue.

On the ſixth day, and ſometimes ſooner, the ſkin of the face and forehead begins to grow rough; and the cuticle breaking, the puſtules die away; while on the reſt of the body the ſpots are broad and red. On the eighth day the ſpots diſappear in the face, and are ſcarce perceivable elſewhere. On the ninth they quite vaniſh; fine, thin, light ſcales, like flour, falling off from the ſkin at that time.

The meaſles in general are not dangerous, unleſs from an inſalubrious epidemical conſtitution of the year, which ſometimes renders them malignant. This may be known by a ſudden loſs of ſtrength, coldneſs of the extreme parts, great reſtleſſneſs, vomiting, difficulty of ſwallowing, and a delirium. If petechial ſpots or miliary eruptions ſupervene, there is great danger. A continual cough, a looſeneſs, and great inquietude, are bad. Profuſe ſweats are no good ſign. When the diſeaſe is ended, if the cough and hoarſeneſs remain, a conſumption and hectic will follow, without ſpeedy aſſiſtance.

Thoſe who die of the meaſles are generally ſuffocated on the ninth day. Some, when the diſeaſe is ended, have a looſeneſs, which continues ſeveral weeks, and brings on a mortal *tabes:* Some have a ſlow fever, with an atrophy and a ſwelling of the abdomen, which are fatal.

If children are ſuſpected to abound with crudities in *primis viis*, it will be proper to evacuate with half a grain of tartar emetic, and ſyrup of ſuccory with rhubarb. When there are worms, anthelmintics ſhould be given. In adults abounding with blood, phlebotomy is neceſſary on the firſt days. Medicines too hot, and cold nitrous things, are equally hurtful. As ſoon as the eruption is ended a gentle cathartic is proper.

In a cough nothing is better than oil of almonds freſh drawn, mixt with ſyrup of capillaire; half a ſpoonful of which ſhould be given often in water-gruel.

To abſorbent and diaphoretic powders, half a grain of ſaffron may be added.

When this diſeaſe attacks women who are ſubject to hypochondriac or hyſteric ſpaſms, or when the menſtrual flux is at hand, it is often atteneded with fainting fits, difficulty of breathing, with conſtrictions of the throat, and great anxiety of the præcordia. Therefore the eruptions are not to be driven out with hot remedies, but rather with ſuch things as allay ſpaſms, paregoric and carminative clyſters, ſometimes bleeding, as alſo a little caſtor and nitre mixt with bezoardic powders. By theſe means the ſpots will appear in a ſhort time.

When a diarrhœa happens, it muſt be cautiouſly treated, and not haſtily ſtopt; becauſe it carries off a great deal of filth, and often puts an end to the diſeaſe. Then it will be beſt to waſh the acrimony out of the inteſtines by demulcent clyſters. But if, when the diſeaſe is over, the diarrhœa continues obſtinate, it will be proper to add a few grains of the bark of eleutheria with bezoardic powders.

When there are hæmorrhages, which are generally ſigns of malignity, nothing muſt be uſed that is directly aſtringent, much leſs opiates and anodynes.

If the patient falls into too profuſe a ſweat, ſo that the linen is quite wet, it muſt be changed very cautiouſly for ſuch as is well aired and warm, otherwiſe the ſpots will ſtrike in. Many have been killed in a few hours, by a ſudden change from hot to cold.

When the ſpots are gone, the patients ſhould not expoſe themſelves to the air; but be careful of their diet; otherwiſe they may fall into an aſthma, ſuffocating catarrh, or conſumption.

Sydenham, for the cough, orders the following.

Take an ounce and an half of the pectoral decoction; ſyrup of violets, and true maiden-hair, of each an ounce and a half: make them into an apozem, and take three or four ounces four times a-day.

Let the patient keep his bed for two days after the firſt eruption.

If, after the meaſles diſappear, a difficulty of breathing, fever, and other ſymptoms, ſhould ſupervene, reſembling an inflamation of the lungs, let blood be taken away freely from the arm, once, twice, or three times, as occaſion ſhall require; leaving a due ſpace between each bleeding; and let the pectoral apozem above deſcribed be given, or oil of ſweet almonds alone. About twelve days from the invaſion, let the patient be purged.

Of the Small-Pox.

The ſmall-pox is commonly divided into two kinds; the diſtinct and confluent.

The diſtinct ſort begins with chilneſs and ſhivering, intenſe heat, a violent pain of the head and back, an inclination to vomit: in adults, a great propenſity to ſweat; a pain at the pit of the ſtomach, if it be preſſed with the hand; a dulneſs and drowſineſs, and ſometimes epileptic fits, eſpecially in children; and if the breeding of teeth is over, it is a ſign the ſmall-pox is at hand; for if the fit happens over night, the ſmall pox will appear in the morning, and are, generally ſpeaking, of the favourable ſort.

On the fourth day from the beginning they break out, ſometimes later, ſeldom before, at which time the ſymptoms either abate or wholly diſappear.

The ſpots at firſt are reddiſh, and ſpread themſelves over the face, neck, breaſt, and the whole body. Then there is a pain in the fauces, which increaſes as the puſtules grow turgid.

On the eighth day the ſpaces between the puſtules, which hitherto were white, begin to grow red and ſwell, and to be affected with a tenſive pain. The eye lids are puffed up, and cloſe the eyes; next to the face, the hands begin to ſwell, and the fingers are diſtended; the puſtules of the face, before ſmooth and red, begin to be rough, (the firſt ſign of maturation,) and whitiſh, and throw out a yellowiſh matter, in colour like a honey-comb.

The

The inflammation of the face and hands being now at the height, the interstices between the puſtules are of the colour of damaſk roſes; and the more mild the diſeaſe is, the greater is the likeneſs.

The puſtules about the face, as they ripen, grow more rough and yellow. But on the hands and the other parts of the body, they grow whiter and leſs rough.

On the eleventh day the ſwelling of the face and inflammation diſappear; and the puſtules being ripe, and of the ſize of a large pea, grow dry, and fall off.

On the fourteenth or fifteenth day they vaniſh entirely; except ſome obſtinate puſtules on the hands, which continue a day or two longer, and then break. The reſt come off in branny ſcales, and in the face leave pits behind them.

Through the whole courſe of this diſeaſe the patient's body is either wholly bound, or he goes to ſtool but very ſeldom. Generally thoſe who die of the ſmall-pox, die on the eighth day in the diſtinct, and on the eleventh in the confluent ſort. Then the face, which ought to be turgid, and the interſtices florid, on the contrary is flaccid and whitiſh, at the ſame time that the puſtules are red and elevated, even after the death of the patient. The ſweat, which was injudiciouſly promoted by cordials and a hot regimen, ſuddenly ceaſes; in the mean while the patient is ſeized with a phrenſy, a violent anxiety, a toſſing and ſickneſs; he makes water often and little, and a few hours cloſe the tragical ſcene.

In the confluent ſort there are the ſame ſymptoms, but much more violent. The fever, anxiety, ſickneſs, vomiting, *&c.* more cruelly torment the patient; yet he does not ſo ſoon fall into a ſweat, as in the diſtinct kind. A looſeneſs ſometimes precedes the eruption, and continues a day or two after it.

On the third day, ſometimes before, ſeldom later, the ſpots appear; and the ſooner, the more will they run together. Sometimes the eruption is retarded till the fourth or fifth day, by ſome terrible ſymptom; ſuch as, a moſt acute pain in the loins, like a fit of the gravel; in the ſide, like a pleuriſy; in the joints, like the rheumatiſm; in the ſtomach, with a ſickneſs and vomiting.

But the ſymptoms do not remit after the eruption, as in the diſtinct ſort; but the fever and other complaints continue to moleſt the patient many days after. Sometimes the ſpots appear like an eryſipelas, ſometimes like the meaſles, but are diſtinguiſhed from them by the time of the eruption. As the diſeaſe increaſes, they do not riſe to any conſiderable height, being intangled with each other in the face; but appear like a red bliſter, and cover all the countenance, which ſwells ſooner than in the diſtinct kind. Afterwards they ſeem not unlike a white pellicle glued to the face, and are not much higher than its ſurface.

The eighth day being paſt, the white pellicle grows daily more rough, and of a duſky colour. The pain of the ſkin becomes more intenſe, and at laſt, in the more cruel kind of this diſeaſe, they do not fall off in broad large ſcales, till after the twentieth day. But this in the mean time is worthy of obſervation, that the more the ripening puſtules are of a browniſh colour, they are the worſe, and the longer in falling off; and the more yellow they are, the leſs they run together, and the ſooner they diſappear.

When the pellicle falls off, there is no roughneſs on the face, but branny ſcales ſoon appear in its room, of a very corroſive nature, which leave deep pits behind them, and ſometimes ugly ſcars; ſometimes the ſhoulders and back are quite deprived of their cuticle.

The danger of the diſeaſe is to be eſtimated from the number and multitude of the puſtules on the face alone. The puſtules of the hands and feet are the greateſt; and the farther they are removed from the extremities, the leſs they are; in adults a ſalivation, and in children a diarrhœa, is a ſign, though not always, of the confluent ſort. The ſpitting ſometimes begins with the eruption, ſometimes two or three days after it; the matter is at firſt thin, but on the eleventh day it is viſcid, and hawked up with difficulty; the patient is thirſty and hoarſe, extremely ſleepy, and his ſenſes exceeding dull: he ſometimes coughs when he is drinking, and the liquor regurgitates through his noſtrils: then the ſalivation generally ceaſes, but the ſwelling of the face ought not to go down quite till a day or two after, when the ſpitting is over; if the hands do not begin to ſwell remarkably, and continue ſo for ſome time, the patient will ſuddenly leave the world.

The diarrhœa does not ſo ſoon attack children as the ſalivation does men. In both ſorts of this diſeaſe the fever predominates from the firſt onſet till the eruption; then it abates till the puſtules are ripe, at which time it terminates.

The day on which the patient is moſt in danger, in the leaſt crude and moſt common ſort of the confluent, is the eleventh from the firſt attack of the diſeaſe; in the more crude, the fourteenth; and in the moſt crude, the ſeventeenth: ſometimes, but very ſeldom, the patient does not die till the twenty-firſt. But in the ſpace of time from the eleventh to the ſeventeenth, as the evening comes on, the patient is daily tormented with a fit of inquietude.

In the management of the patient in the diſtinct ſort, regard ſhould be had to the ſeaſon of the year, and the ſtrength of the patient. Let this be a general rule, to keep the patient in bed during the firſt days of the diſtemper, taking care to defend him from the inclemency of the winter by proper means; and to moderate the exceſſive heat in ſummer by cool air. For the patient ought not to be ſtifled by heat and cloaths, nor ſhould the eruption and perſpiration be checked by cold. However, great care ought to be taken in general to ſupply him with pure and cool air; becauſe a hot air cauſes difficulty of breathing, checks the ſecretion of urine, and increaſes the number of puſtules on the internal organs of the body.

With regard to DIET, it ought to be very ſlender, moiſtening, and cooling; ſuch as oatmeal or barley-gruel; and in the beginning, the beſt regimen is that which keeps the body open, and promotes urine. This end is obtained by boiling preſerved fruits with their food, ſuch as figs, Damaſcene plums, and tamarinds; and by giving them ſubacid liquors for drink; as ſmall-beer acidulated with orange or lemon juice; whey turned with apples, boiled

boiled in milk; emulſions made with barley-water and almonds; Moſelle, or Rheniſh wine plentifully diluted with water; or any other things of this kind.

In the cure, Sydenham directs bleeding on any of the three firſt days to nine or ten ounces; and then an ounce, or an ounce and a half of emetic wine. But ſome phyſicians will not allow a vomit by any means, unleſs there is a nauſea, and the head is much affected. Yet Hoffman judges it to be proper on the firſt day of the invaſion, and preſcribes two grains of emetic tartar diſſolved in cinnamon water, to adults.

In youths and adults, it is often neceſſary to take away blood two or three times, only with an intermiſſion of two or three days between each time. Blood-letting is ſo far from being an obſtacle to the eruption of the puſtules, if the patient is not too weak, that it forwards it conſiderably.

After BLEEDING, a vomit ſhould be given, if the ſtomach abounds with phlegm or bile, or be loaded with food unſeaſonably taken. Otherwiſe a purge may be preſcribed before the eruption of the puſtules: which may be the infuſion of ſena with manna, or manna alone, eſpecially for children; for no diſturbance is to be raiſed in the body.

To keep the inflammation of the blood within due bounds, and to aſſiſt the expulſion of the morbific matter through the ſhin,

Take half an ounce of bezoar in powder, 2 drams of purified nitre. Mix, and beat into a powder.

Half a dram of this may be taken by an adult three or four times in a day; diminiſhing the quantity for children in proportion to their age.

Sometimes equal parts of theſe ingredients may be preſcribed; and if the effervefcence of the fever runs very high, a proper quantity of the ſpirit of vitriol may be added to the patient's drink. But if there be any reachings to vomit, they will be removed by draughts containing half an ounce of the juice of lemons, with one ſcruple of the ſalt of wormwood.

When the eruption of the puſtules is compleated, which generally happens on the ſixth day from the attack, let the patient take an ounce of diacodium every evening till the tenth day after the invaſion. On that night, if the ſmall-pox be of the confluent kind, the doſe muſt be increaſed to an ounce and a half; and an ounce in the morning; and ſo an ounce and half every night till the patient is recovered.

Whatever are the ſort, and at whatever time of the diſeaſe a phrenſy ſhall happen, it is to be curbed by paregorics, given one after another till the end is obtained, only waiting to ſee the effect of one doſe before another is ordered.

In the mean time, if the patient is coſtive, which is generally the caſe, and the fever continues, the body is to be opened with a clyſter every ſecond or third day.

If the method is proper in the diſtinct ſmall-pox, it will be found more neceſſary in the confluent, which is attended with greater fear and danger.

In every ſort of this diſeaſe, it is proper to open the body on the decline, that is, on the ninth or tenth day from the eruption, becauſe a putrid fever generally comes on about that time, while the puſtules are drying, or upon the ſubſidence of the ſwelling of the inflamed ſkin, where there is no ſuppuration, which fever cannot be taken off with equal ſafety by any other means; but gentle cathartics alone are to be employed in this caſe, ſuch as were directed before the eruption of the puſtules.

It will alſo be of uſe at this time to take away ſome blood, if the heat be too great, and the patient have ſtrength to bear it.

This putrid fever is by Sydenham called the ſecondary fever, which comes on with heat, inquietude, toſſing, *&c.* and, unleſs prevented, takes off the patient in two or three days. He mentions this fever as coming on the eleventh day, or later; but this is to be underſtood from the time of the invaſion, whereas Mead reckons from the time of the eruption. Sydenham preſcribes large bleeding, and a cathartic two days after, *viz.* one ounce of lenitive electuary diſſolved in 4 ounces of ſimple alexeterial water, together with the free uſe of paregorics.

If the ſpittle through heat is ſo tough that it cannot be hawked up, let a gargle be frequently injected into the throat with a ſyringe. It may be compounded of barley-water and honey of roſes.

When the matter of ſalivation grows very viſcid, and begins to clog the larynx and trachea, the beſt method is to boil marſh mallows, myrrh, and honey, in a ſufficient quantity of water and vinegar, and to tranſmit the ſteam of the decoction into the patient's mouth, thro' a glaſs or tin tube, of ſuch a ſhape and length as is moſt commodious for a recumbent poſture.

From the eighth day to the end of the diſeaſe, garlick may be applied to the ſoles of the feet; which muſt be renewed every day, eſpecially when the brain is affected.

When the puſtules are perfectly dry and withered, the face may be anointed with a liniment, made of equal parts of oil of ſweet almonds and pomatum, for two days and no longer.

Twenty one days after the invaſion, let a vein be opened in the arm, and the next day give a cathartic, which may be repeated every other day three times more.

This is neceſſary, becauſe no ſpecies of fever requires the body to be thoroughly cleared of the remains of the diſeaſe more than this. After the cathartics, the body is to be reſtored to its former ſtate by a courſe of milk, eſpecially that of aſſes, with ſuitable food, and the air and amuſements of the country.

As there are particular accidents in the ſmall-pox which do not commonly occur, it will be proper to ſay ſomething of them. Sometimes the patient is ſeized with convulſions juſt before the eruption, which is rather a good than a bad ſign in children. In this caſe, blood-letting is carefully to be avoided; but a bliſter is to be applied to the neck, and to the ſoles of the feet. Plaiſters made of equal parts of the cephalic and bliſtering plaiſters; not forgetting to give antiſpaſmodic medicines inwardly. The chief are wild Valerian-root, Ruſſian caſtor, and the ſpirits of volatile ſalts chemically extracted from animals.

In adults, the thing is otherwiſe; for they, if not too weak, may loſe a moderate quantity of blood, and then be put into the foregoing method.

Haller tells us, that camphire aſſiſts greatly in filling the ſmall-pox of the confluent kind with petechiæ; and Monro, that the Peruvian-bark does the ſame, that it filled the empty veſicles with matter, changed the watery ſanies into thick white pus, made the petechiæ or ſpots turn gradually to a pale colour, and cauſed the pox to blacken ſooner than was expected. The doſe in powder, is from ten to twenty grains, in ſome rich ſyrup, with an aromatic diſtilled water, every four or five hours. Children may take it in a clyſter, with a ſmall quantity of warm milk, after the bowels are unloaded with a preparatory clyſter. If the clyſter was retained too ſhort a time, ſyrup of poppies was added, or diaſcordium. Theſe injections were repeated morning or evening or oftner. The bark has had good effects in mitigating the ſecondary fever. When the lungs are greatly ſtuffed, it is not to be given.

When the eruption appears without much fear or pain, it is not without danger; for the puſtules frequently do not tend to maturity, and there is no ſuppuration made. Hence the fever increaſes, with inquietude of body, anxiety of mind, difficulty of breathing, and a delirium, which carry off the patient in a few days. In this ſtate, the fever ought rather to be raiſed than checked; and then warm medicines are to be directed which promote ſuppuration, by increaſing the motion of the blood, and thinning the humours, ſuch as Virginia ſnake-root, contrayerva-root, ſaffron, aſſa-fœtida, myrrh, and the like.

But above all, Blisters muſt be laid on the limbs.

When the matter of the infection is over abundant, as it happens in bad caſes, nature never fails endeavouring to throw off the load. Thus in adults a ſpitting comes on upon the firſt days of the eruption; whereas children have a looſeneſs almoſt through the whole diſeaſe, which is not to be inconſiderately ſtopped. So in adults, if the ſpitting does not go on to our wiſhes, it ought to be promoted by medicines which ſtimulate the glands of the mouth, eſpecially gargles made of a decoction of muſtard-ſeed and pepper, with the addition of oxymel. For in the confluent and malignant ſmall-pox, if this flux does not ariſe and continue to the end of the diſeaſe, it is a very bad ſign.

The method of abating the rigour of this diſeaſe, and preventing the great mortality with which it was often attended, by inoculation, is now ſo well known and ſo generally practiſed, that a particular detail of it in this place is unneceſſary.

Of the Erysipelas, *or St* Anthony's Fire.

An Erysipelas is an eruptive fever, from which no part of the body is exempt; but it chiefly attacks the face. It begins with chilneſs and ſhivering, and other common ſymptoms of a fever. The part affected ſwells a little, with great pain, and intenſe redneſs, and is beſet with a vaſt number of little puſtules; which when the inflammation is increaſed, are converted into ſmall bliſters.

This diſeaſe has great affinity with a peſtilential fever; for it begins ſuddenly, with great ſhaking, heat, loſs of ſtrength, violent pain in the back and head; to which may be added vomiting, and a delirium; but this is to be underſtood of the worſt ſort. On the third or fourth day the malignant matter is thrown out on the ſurface of the body, and then the ſymptoms a little abate. There is often a pain, redneſs, and tumour in the inguinal glands, from whence matter of a hot fiery quality deſcends to the feet. If the head is attacked, the parotid glands are affected; if the breaſts, the axillary. The mammary and axillary glands are not ſeldom ulcerated, and affect the joints with a virulent corruption. And likewiſe, as in the plague, there is nothing more dangerous than the return of the expelled matter back from the ſurface of the body to the inward parts.

In ſome, eſpecially young perſons, the matter is not ſo virulent, nor the fever ſo great; the glands remain unaffected, and the eruption happens on the ſecond day. This is not at all dangerous.

An eryſipelas is either true, or ſimple and ſpurious, which is likewiſe called ſcorbutic. The ſimple only affects the ſurface of the ſkin, and readily yields to proper remedies. But the ſpurious is more chronic, is harder to cure, and often degenerates into malignant ulcers. Beſides, this diſeaſe is ſometimes idiopathic, or a primary diſeaſe; and ſometimes ſymptomatic, or a ſecondary one. For inſtance, in the anaſarca, the aſcites, the yellow and black jaundice, a ſymptomatic eryſipelas ſometimes ſupervenes, and quickly kills the patient.

If it ſeizes the Foot, the parts contiguous will ſhine; if it be attended with great pain, it will aſcend to the legs, and will not bear to be touched.

If it attacks the Face, it ſwells and looks red, and there are plenty of watery veſicles. The eyes are cloſed up with the ſwelling; there is a difficulty of breathing; the fauces and noſtrils are very dry, often attended with a numbneſs and drowſineſs: hence an inflammation of the brain is to be feared, or a mortal lethargy.

If it affects the Breasts, they ſwell, and grow almoſt as hard as a ſtone, with exquiſite pain, and they are very apt to ſuppurate. There is a moſt violent pain in the axillary glands, in which an abſceſs is often formed.

In children the umbilical region generally ſuffers, with a fatal event.

If in a day or two the tumour ſubſides, the heat and pain ceaſe, the roſy colour turns yellow, the cuticle breaks and falls off in ſcales, the danger is over. When the eryſipelas is large, deep, and falls upon a part of exquiſite ſenſe, the patient is not very ſafe. But if the red colour changes into black and blue, it will end in a mortification. If the inflammation cannot be diſcuſſed, it will ſuppurate, and bring on fiſtulas and a gangrene. When the patient is cacochymic, the leg will ſometimes ſwell three times as big as the natural ſize, and is cured with great difficulty. Thoſe who die of this diſeaſe, die of the fever, which is generally attended with difficulty of breathing, ſometimes a delirium, ſometimes with ſleepineſs; and this in ſeven days time.

Let the patient's diet be only water-gruel, or barley-broth, with roaſted apples. If he drinks any beer, let it be very ſmall; and let him keep out of bed ſome hours in a day.

Take away 9 or 10 ounces of blood, and the next morning let the patient take the common purging potion.

It is a conſtant rule among practitioners, in all acute and eruptive fevers, to keep the body in a gentle diaphoreſis.

resis. The same method is to be observed in this disease.

If the patient is plethoric, addicted to spirituous liquors, and more especially if the disease attack the head, bleeding is necessary.

It will be safest to avoid external applications, unless a powder made of elder-flowers and liquorice sprinkled on the part; or lime water, mixt with a fourth part of spirit of wine and camphire, dipping a linen cloth in it several times doubled, and applying it hot to the part.

An infusion of scordium, elder-flowers, and fennel-seed, drank in the manner of tea, is useful to expel the morbific matter.

If the disease does not yield to the first bleeding, let it be repeated: if that will not do, let it be reiterated twice more; one day being interposed between.

On the days free from bleeding, prescribe a clyster of milk and syrup of violets.

Some think purges not necessary in the beginning of this disease; but in an erysipelas of the head, when it affects the brain with a coma and a delirium, either the case is desperate, or cathartics will succeed. However, first apply blisters to the neck.

If, after all, the tumor remains, and begins to turn livid; if the pain lies deep, and seems to reach the periosteum, and the part has a tendency to ulcerate; then it will be proper to promote a suppuration; at the same time endeavouring to stop the progress of the putrefaction. For this purpose the common plaster will be proper, with a sufficient quantity of camphire and saffron. When there is matter that lies deep, the tumour is to be opened with a lancet, and the pus is to be got out by degrees, not all together.

When the abscess is in a glandulous part, and has degenerated into a fistulous ulcer, after evacuating the matter, a balsamic liquor is to be injected, made of tincture of St. John's wort, tincture of balsam of peru, choice myrrh, and a few drops of the spirit of turpentine.

When there is a mortification coming on, give things inwardly that resist putrefaction, as nitre and a little camphire, [or rather the Peruvian bark.] Outwardly apply a mixture of lime-water, camphorated spirit of wine and vinegar with litharge; as also tincture of myrrh, [or of myrrh and aloes] made pretty hot, with a linen cloth doubled, and often repeated.

In the scorbutic erysipelas, which continues for some time, it will be proper to give gentle laxatives and purifiers of the blood, with diaphoretics. After the body has been opened for some days, give diuretics and diaphoretics alternately for a considerable time; and for common drink, order a temperate decoction of mucilaginous woods and roots with bitters; particularly succory roots, dandelion-roots, and raisins.

Of the SYNOCHUS, *or Continual* FEVER *without remission.*

THIS fever, by some called SYNOCHA, by others a CONTINUAL FEVER, is an acute sanguineous fever, because it is raised by a congestion of the blood, chiefly in the nervoso-membranous parts; which, unless timely discussed by the benefit of nature and art, produces a fatal inflammation.

It begins, in some, with a mild sense of cold, and is soon attended with very grievous symptoms, continuing without remission till the critical time, with a great and full pulse. If the blood is forced to the head, for it always affects one part more than another, the face will swell, the eyes will be red and full of tears; there is a pain in the head, with a pulsation of the temporal arteries, a vertigo, a sleepiness, torpor, or a raving. When the blood rushes impetuously into the ventricles of the heart and pulmonary vessels, causing a distention therein; then the breathing will be thick and difficult, with a straitness of the breast, as also an anxiety and palpitation of the heart, attended with a loss of strength, and a dejection of the mind. A slight inflammation of the œsophagus, with a spastic stricture of the glands of the fauces, will cause thirst, dryness and blackness of the tongue. If the inflammatory congestion happens in the stomach, it will create a nausea, a reaching to vomit, and sometimes a hiccup. If in the intestines, there will be inflations grievously exasperating the disease, together with a costiveness, or an ejection of fetid excrements. If in the vessels proceeding from the mesaraic arteries and vena portæ, there will be a fixed pain at the first vertebra of the loins: if in the membranes of the spinal marrow, the patient will tumble and toss and lie irregularly in bed, and will have a torpor and languor of the limbs, sometimes attended with convulsions.

But all these symptoms never happen to all, nor is their violence constantly alike. Some distinguish this fever into the simple and putrid. The first is caused by a congestion of good blood in improper places. But when it attacks persons full of impure juices, who have been weakened by a preceding disease, constant anguish of the mind, excessive coition, or inordinate living, the symptoms are much more grievous, with loss of strength, and the disease will continue till the fourteenth or the twenty-first day, sometimes with eruptions, dusky or black spots, with immediate danger.

If the cause is not violent, this disease will often disappear, merely by the benefit of nature, on the fourth, seventh, or eleventh days, with a large sweat or bleeding at the nose, and, though very seldom, by a flux of the belly, unless it has something of malignity.

When the disease is rightly managed in the beginning, that is on the first, second, and third day, with bleeding and cooling things, and gentle diaphoretics, it will end on the fourth. But if the bleeding is omitted, or is too little, it may continue till the fourteenth or seventeenth day, with the more grievous symptoms, as also a delirium; but it will terminate at last by a sweat or loosenes.

When it proves fatal, the patient generally dies of a sphacelous inflammation of the brain, or other parts, as the stomach or intestines.

The intentions of cure are, 1. To free the vital parts from too great a congestion of blood, which will either disperse a slight inflamation, or prevent a great one. 2. To appease the exæstuation of the blood and the spastic affection of the system of the nerves. 3. To discuss the stagnating and corrupted fluids, and to restore a free circulation of the blood, chiefly to the surface of the body.

To answer the first intention, the patient must lose blood

blood freely. Then the orgaſm of the blood muſt be appeaſed with diluents, acids, and nitrous compoſitions. And certainly if any diſeaſe requires acids, and the juice of tart fruits, it is this, ſuch as tamarinds, and the juices of currants, oranges, and lemons.

Take two pounds of water; roſe-water, white ſugar, and juice of oranges, of each one ounce.

The jelly of hartſhorn made pretty thin, with the addition of orange-juice, ſugar, and roſe-water, will make a proper demulcent and cooling drink; or whey turned with juice of lemons or oranges.

To direct the motion of the blood to the ſurface of the body, gentle diaphoretics will be proper, ſuch as the bezoardic or abſorbent powders, ſometimes alone, and ſometimes with citron juice. Likewiſe infuſions of the leaves of *veronica*, *ſcordium*, or *carduus benedictus*, with fennel-ſeed, drank in the manner of tea, eſpecially to promote ſweating on the fourth day, when the diſeaſe is like to terminate with this ſalutary excretion.

It will be neceſſary, whether this fever be ſimple or putrid, to keep the body open; for which purpoſe a clyſter made of whey, honey, oil of ſweet almonds, with a little nitre and ſalt, will be proper; for by this means the ſtricture of the inteſtinal fibres will be relaxed, and flatus's will be diſcharged, which diſtend the colon. In the decline of the diſeaſe, when there are apparent ſigns of coction in the urine, a laxative of manna and cream of tartar, or caſſia and rhubarb, will be of great uſe.

Of the Bilious Fever.

The bilious is a kind of a burning fever. It begins with intenſe heat, thirſt, anguiſh, and inquietude. There is likewiſe a vomiting, or a perpetual reaching to vomit, with frequent bilious ſtools, a coldneſs of the extremities, internal heat, and cardialgic anxiety. This fever is either acute, or very acute. In this the ſymptoms are more violent, the bilious purging upwards and downwards is very plentiful, joined to a *cardialgia* with fainting. It generally kills before the ſeventh day, with an inflammation of the ſtomach and duodenum; the ſigns of which are, a fixed igneous heat about the *præcordia*, with a coldneſs of the extremities, high inquietude and anxiety, a hiccup, and a plentiful eructation of bile and ſalival liquor, a jaundice-colour of the countenance, and a hippocratic face.

Some are not ſo acute, but run a greater length, with now and then a remiſſion, and perhaps an intermiſſion, and have an exacerbation, with vomiting, anxiety, and coldneſs every other day, or every third day, and ought to be called continual quotidians or tertians.

It is cauſed by a bilious fluid ſecreted plentifully in the liver, and poured out into the ſtomach and duodenum, where by its acrimony and corroſiveneſs it ſtimulates the nervous tunics, corroding and inflaming them; whence the ſymptoms proper to this fever ariſe, ſuch as a burning heat, a cardialgic anxiety, a nauſea, a reaching to vomit, and a violent purging upwards and downwards.

Hoffman, in the cure of the bilious fevers mentioned by him, would have the cauſtic acrimony of the bilious juices abated and ſheathed by abſorbent powders and nitre, which ſhould be taken in a ſufficient quantity of a liquid, and often repeated. He likewiſe recommends emulſions of almonds, of the cold ſeeds; elder flower water, roſe-water, *&c.* as alſo jellies of hartſhorn, milk and water, oil of ſweet almonds, ſweet whey, chicken broth.

After theſe things, medicines muſt be given to reſtrain the impetuous bilious excretions, and to abate the too quick ſyſtaltic and periſtaltic motion of the biliary ducts, and to prevent the too great excretion of the bile.

In the cure of the Bilious Fever of the camp, Pringle, before it becomes continual, depends on the proper uſe of evacuations, the neutral ſalts, and the bark. Bleeding is the firſt thing to be done in every caſe, and is to be repeated once or oftener, according to the urgency of the diſtemper. The vernal and later autumnal remittents are accompanied with rheumatic, pleuritic pains, and other ſymptoms of high inflammation, which require more bleedings than the intermediate ſeaſon. To omit this, and give the bark too ſoon, will bring on an inflammatory fever A vein may be opened ſafely either during the remiſſion, or in the height of the paroxyſm.

After bleeding, give an emetic in the remiſſion or intermiſſion of the fever, and rather ſoon after a paroxyſm than before one. But emetics do harm when the ſtomach is inflamed, or when the diſeaſe has continued ſome time, and has aſſumed the type of a continual fever. However, we may ſafely give one when the fever intermits, or has conſiderable remiſſions. Ipecacuanha is ſafeſt, but antimonials moſt efficacious. If the remiſſions are ſmall, or the fever great, or there is a tendency to vomit, the former is beſt. But when the remiſſions are diſtinct, or the remiſſion perfect, the latter ſhould be preferred; or it may be joined to the former; that is, two grains of tartar emetic, with a ſcruple of the powder of ipecacuanha. Thoſe vomits are beſt which produce ſtools, eſpecially if they procure a plentiful diſcharge of corrupted bile upwards or downwards.

If the body continues coſtive, a laxative will be proper, eſpecially if there is a teneſmus, or pains in the bowels. The ſaline draught, with ſalt of wormwood and lemon-juice, will bring the fever ſooner to regular intermiſſions.

Whenever the ſweats are not profuſe enough in proportion to the fits, the quantity of an ounce of *ſpir. Mindereri* may be given, divided into two or three draughts, before they go off. It promotes a plentiful diaphoreſis, without heating.

As the fevers are never without an inflammation in the beginning, and then rarely have complete paroxyſms, the bark is not to be given till the urine breaks, and there are entire ſhort intermiſſions; nor yet before bleeding, as was obſerved above; nor before the firſt paſſages have been cleanſed; otherwiſe the fever will return, or a tympanites will be produced.

It is beſt to give the bark in ſubſtance in Rheniſh wine; or an ounce of it may be made into an electuary, with ſyrup of lemons, and a dram of ſal ammoniacum. If the patient has not been purged, it will be proper to add as much rhubarb as will keep the body open for the firſt two or three days of uſing that medicine, It is chiefly uſeful when the bilous humonrs abound, as they moſtly do in marſhy countries. If the paroxyſms are quotidian, and the

the intermiſſions ſhort, it may be neceſſary to give the bark before the ſweating is quite over.

If the diſeaſe has been neglected in the firſt ſtages, or if after the remiſſions or intermiſſions it changes to a continual fever, with a full and hard pulſe, a vein muſt be opened. But if there is a pain in the head, or a delirium, and the pulſe ſmall, it will be beſt to apply leeches to the temples. But whether the patient is bled or not, bliſters are the beſt remedy. If the *primæ viæ* are loaded, clyſters or a laxative may be proper; but neither vomits nor purges; nor are thoſe to be repeated without caution. To theſe remedies the ſaline draught may be added.

Sweating is the proper criſis: it is never to be promoted by theriaca or volatiles; but when the pulſe ſinks, and petechiæ, or other ſymptoms appear, it will be proper to uſe the warmer alexipharmics, and to treat the diſeaſe like a malignant fever.

A looſeneſs is the leaſt favourable criſis: yet if there are colic pains, or a tenſion of the belly, attended with dryneſs of the ſkin, it will be proper to procure ſtools by a clyſter, or a gentle laxative, ſuch as the infuſion of rhubarb with manna; which is to be repeated as the patient can bear it.

Of a Causus, *or* Burning Fever.

The principal ſymptoms of a cauſus are, a heat almoſt burning to the touch, moſt remarkable about the vital parts, but more moderate towards the extremities, which are even ſometimes cold: the breath is extremely hot; there is a dryneſs of the whole ſkin, noſtrils, mouth, and tongue. The reſpiration is thick, difficult, and quick; the tongue is dry, yellow, black, parched, and rough; the thirſt is unquenchable; there is loathing of food, a nauſea and vomiting; an anxiety, inquietude, and great laſſitude; a little cough, a ſhrill voice, a delirium, a phrenſy, a continual watching or a coma, convulſions, and on the odd days an exacerbation of the fever.

In this temperate climate theſe ſort of fevers are very rare; thoſe that are more common among us are the burning ſanguineous, or the continual bilious fevers without remiſſion.

This begins without any remarkable coldneſs or ſhivering, with great heat, thirſt, watching, anxiety and inquietude. In ſanguineo-bilious conſtitutions, and in bodies full of hot bilious blood, they terminate in critical days in health or death, being firſt preceded with a ſhaking. They terminate in a ſalutary manner, with a ſweat or a bleeding at the noſe.

On the third and fourth day it often proves mortal; it ſeldom exceeds the ſeventh, if violent.

It is often terminated by an hæmorrhage; which if ſmall on the third and fourth day, it is a fatal ſign. It is beſt if it happens on a critical day.

A ſolution of this fever on a critical day, may alſo be by vomiting, ſtool, ſweat, urine, or ſpitting thick phlegm. If the exacerbation of this diſeaſe happens on the ſecond or fourth day, it is a bad ſign; on the ſixth, not ſo bad.

The urine black, ſmall in quantity, and thin, is fatal; ſo is ſpitting or piſſing of blood. A difficulty of ſwallowing is a bad ſign; but the worſt of all is coldneſs of the extreme parts. The face red and ſweaty, is bad; a parotis not tending to ſuppuration is fatal; the body too looſe is fatal. A tremor turning into a delirium is mortal: it often changes into a peripneumony with a delirium. When this diſeaſe ſucceeds gripings of the bowels, it is worſt of all.

A critical determination of this fever is uſually preceded by a rigor, or ſhaking.

The Cure of a burning fever is moſt eaſily obtained in a pure, cool air, frequently renewed: The patient muſt not be oppreſſed or ſtifled with bed-cloaths, but ſhould ſit up often. He ſhould drink plentifully of ſoft, ſub-acid, aqueous, and warm liquors. His diet ſhould be light, made of pearl barley, oatmeal, and ſub-acid fruits.

Bleeding is neceſſary at the beginning, if there is a plethora, or ſigns of a particular inflammation, or the heat is intolerable, or the rarefaction too great, or a revulſion neceſſary, or the ſymptoms urgent, in which circumſtances the diſorder is hardly to be vanquiſhed by any other remedies.

Soft, diluting, laxative, antiphlogiſtic cooling clyſters, are to be repeated as oft as the heat, coſtiveneſs, and revulſion require them.

The whole body is to be moiſtened by receiving into the noſtrils the ſteams of warm water; by waſhing the mouth, throat, feet, and hands, with the ſame; by fomenting with warm ſpunges the places where the veſſels are moſt numerous, and moſt expoſed to the touch.

The medicines ſhould be aqueous, ſoft, nitrous, gratefully acid, gently laxative, not promoting ſweat and urine by their acrimony, but by their plenty; ſuch as remove the contraction of the fibres, reſolve the thickneſs of the humours and dilute, and temper their acrimony.

To appeaſe thirſt in this diſeaſe, and to moiſten the tongue and parched fauces, there is nothing better than ſweet whey, in a quart of which half a dram of pure nitre has been diſſolved. Small draughts of this, a little cool, may be drank frequently, which will likewiſe extinguiſh the pernatural heat. The mouth and throat may alſo be waſhed with water, mixt with ſyrup of mulberries and nitre.

Purgatives are dangerous before the criſis, but clyſters may be uſed, made of milk, honey, and a little nitre. After the criſis, which is known by the ſediment in the urine, laxatives made with tamarinds, manna, rhubarb, raiſins, or cream of tartar, are abſolutely neceſſary

Of the Burning Bilious Fever, *or* Yellow Fever *of the* Weſt Indies.

The yellow fever begins with a momentary chilneſs and ſhivering, which is ſoon ſucceeded by a burning heat all over the body, but is felt more intenſely about the præcordia. The pulſe is high, ſtrong, and rapid; the eyes are heavy; with a throbbing pain in the head, and a violent beating of the temporal arteries, and a thick, laborious reſpiration: There is a nauſeouſneſs, and reaching to vomit; and when any thing is thrown up, it is of the bilious kind: Beſides theſe, great anxiety, pain in the back and loins, and an uneaſy laſſitude in all the limbs.

About twelve hours after the invafion, the tongue is dry, harfh, rough, and difcoloured, with infatiable thirft; there is a forenefs all over the body, great reftleffnefs, and a delirium.

In the laft ftage the patient labours under a great coma, oppreffion of the præcordia, heaving of the lungs, an interrupted refpiration, tremblings of the tendons, convulfions, and cold clammy fweats.

It ufually terminates in a favourable crifis, or the death of the patient, about the fourth day after the attack.

The regular crifis generally difcovers itfelf by a fuffufion of the bile all over the furface of the body about the third day. The faffron tincture is frequently difcovered in the eyes twelve hours after the invafion: the fooner it appears, the more favourable is the prognoftick.

If the jaundice comes on too foon, it is bad; if with livid fpots, which fometimes, though rarely, appear, it is fatal. If the fkin continues obftinately dry and rough, the cafe is dangerous; and the more fo, the longer it continues; for thefe very feldom recover, be the pulfe ever fo good. The pulfe is not to be depended on; for many have a good pulfe a few hours before death. If the vomitings are inceffant, grow darker, and the hiccup comes on, it is generally fatal. If the face is greatly flufhed, and the veffels of the white of the eye are turgid with blood, as in an ophthalmia attended with a phrenzy, the patient is likely to die in a very little time, efpecially if the fkin is dry.

But if the head continues clear, the pulfe becomes foft, the pains, naufea, and anguifh are relieved by bleeding; as alfo if the humours vomited up are carried downwards by laxatives; if then the inquietude ceafes, the fkin grows foft and moift, and the patient has better fpirits; it is probable he will recover.

Bleeding is the firft thing to be done, more or lefs, according to the force of the difeafe and the ftrength of the patient; and, if the fymptoms continue in their full vigour, fhould be repeated once in fix or eight hours, leffening the quantity proportionably each time.

After the firft bleeding, give a vomit of ipecacuanha, quickened with three or four grains of emetic tartar, (or rather two grains,) which will bring up a great quantity of yellow, porraceous, and fometimes blackifh bile, and carry the humours downwards.

After this the patient may drink plentifully of diluting, refrigerating, and fubacid liquors, made with oranges, lemons, tamarinds, fpirit of fulphur, fpirit of vitriol, and fuch like, in barley-water, fpring-water, or other thin and cooling vehicles. He may likewife be allowed tartifh juicy fruits; as ananas, granadilloes, Barbadoes cherries, and water-melons; as alfo plantains, and bananaes, roafted for food, jelly of guavaes, *&c.*

Cooling teftaceous powders are likewife very beneficial.

Towards the evening it will be neceffary to inject a clyfter, made of the common decoction, with half an ounce of cream of tartar, an ounce of manna, or an ounce of pulp of caffia added to it.

When the operation of the clyfter is over, paregorics will be proper, as thus:

Take 2 ounces of mint-water, one ounce of cinnamon water, 25 drops of the tinctura thebaica, and a fufficient quantity of fugar.

The room fhould be kept cool, and fprinkled with vinegar, rofe-water, and cooling herbs. Frefh air fhould be admitted, but not to blow directly on the patient's body.

Blifters are alfo of great efficacy at this juncture; which if applied before it be too late, a coma, the deadly fymptom of this diftemper, very rarely enfues.

The patient's diet fhould be nothing but thin panada and water-gruel, gratefully fweetened and acidulated.

Befides plentiful and frequent draughts of cooling liquor, the patient fhould be allowed preferved tamarinds, flices of lemon with a little fugar; but above all, penguins, which by their fharpnefs penetrate the thick tenacious fcurf, whereby the glands of the mouth will be unloaded. Opiates muft alfo be ufed in larger dofes than in Europe.

Cooling and lenient clyfters muft alfo be repeated every eight hours.

When the patient begins to be comatofe, the third and laft ftage of the difeafe is advancing; in which are, difficulty of breathing, oppreffion of the *præcordia*, convulfive twitching of the tendons, interruption of the pulfe, and at length its total ceffation.

In this cafe, a compleat fet of blifters muft be immediately applied, or the old ones renewed; which muft be laid to the nape of the neck, on the wrifts, thighs, and legs, and a large one on the crown of the head. To the foles of the feet may be laid a cataplafm of falt-herrings and muftard.

With regard to the urgent fymptoms; pains of the head, watchfulnefs, and deliria, are to be relieved by emollient and laxative clyfters, gentle purgatives, cupping with fcarification, opening the frontal vein, lotions of the feet, and narcotics.

Blifters are alfo ufeful for the fame purpofe.

Convulfions require much the fame treatment externally; and internally, *aurum mufivum*, (the dofe from four grains to a fcruple.) To reftore the ftrength of the patient, little more is required than a ftomach-purge or two, mild and agreeable bitters, and a reftorative regimen of broths, jellies, and white meats.

If the yellow tincture remains upon the fkin, give a vomit of ipecac. and a purge or two with the decoction of fenna, tamarinds, *&c.* and allow the ufe of lemons, oranges, and other acid fruits. If this diforder proves obftinate, treat it as the jaundice.

Of the Senegal Fever.

The fever which chiefly prevails in this country in the months of July, Auguft, and September, is of the worft kind. It ufually begins with drowfinefs, laffitude, and great rigors, which continue frequently three or four hours, and are fucceeded by intenfe heat and fweats. For three or four days it remits, and both the fhiverings and hot fits become more moderate. During this period, the pulfe is quick and low; but afterwards becomes fuller, unlefs fome evacuation intervene. At this time profufe fweats are eafily brought on; in which cafe there are little hopes of recovery. A parched, dry fkin, is as bad a fymptom, if it continues more than a day; for an

interrmitting

intermitting pulſe and a delirium ſucceed, and continue for ſeven or eight days, the frequency of the intermiſſions increaſing every day: but if a general moderate moiſture comes one at this, or any other time of the diſorder, and continues, the patient recovers. A violent pain in the head and back, and difficulty of breathing, are general complaints. Sudden languors, and bilious vomitings, are frequent through a great part of the time.

Some are taken with a great heat, and a ſtrong quick pulſe, without any ſhiverings or remiſſions, as abovementioned. In this caſe the patient ſooner dies upon the appearance of bad ſymptoms, and is longer in recovering upon the appearance of good ones.

The loſs of eight or ten ounces of blood, in the firſt attack of theſe fevers, has ſunk the pulſe beyond a poſſibility of raiſing it afterwards, and that even in plethoric habits, attended with great pains of the head. It is, indeed, ſurpriſing how little theſe fevers will bear of evacuations of any kind, eſpecially bleeding.

After profuſe ſweats, the pulſe becomes extremely ſlow; and, though the ſweating goes off, continues ſo for two or three days, with anxiety and reſtleſſneſs; after which the pulſe grows quick, the ſkin parched and hot, and a ſeries of bad ſymptoms comes on.

The ſick are always comatoſe and ſtupid; which ſymptom is little dangerous when attended with a warm moiſture on the ſkin, but otherwiſe it is generally fatal.

It is of great conſequence to keep up the pulſe; but here the common cordial medicines are ineffectual; yet the decoction of the bark, with the camphorated julep, and ſpirit of vitriol, anſwers this purpoſe effectually, ſo as to render any other medicine unneceſſary, except occaſionally a gentle emetic or laxative.

Of the Inflammation *of the* Stomach.

The inflammation of the ſtomach is known by a burning, fixed and pungent pain in the ſtomach, which is exaſperated at the inſtant any thing is taken into it; and is ſucceeded by a moſt painful vomiting and hiccup. There is always a violent internal heat, high anxiety, and a grievous pain about the præcordia, chiefly at the pit of the ſtomach, an acute, continual fever, great thirſt, difficult breathing, inquietude, toſſing of the body, coldneſs of the extreme parts, a hard, contracted, quick, and ſometimes unequal pulſe.

It may be diſtinguiſhed from other diſorders of the ſtomach; for in the cardialgia, there is alſo a great anxiety about the præcordia, a preſſing acute pain reaching to the back, a coldneſs of the extremities, a conſtant ſtimulus to vomiting, with inquietude: But the heat in the region of the ſtomach is not ſo violent, nor is the thirſt and dryneſs of the tongue ſo great, nor the pulſe ſo quick and contracted, and the ſtomach can better bear and retain any thing taken inwardly; nay, is frequently relieved thereby. An inflammation of the inteſtines has a pain or gripes more about the region of the navel, with frequent, frothy, bilious ſtools, or a little bloody, with a heat over all the ſurface of the body, and a quick large pulſe: Whereas in this diſeaſe the extremities are cold.

If it be cauſed by drinking cold liquors when the body is hot; or from an effuſion of the bile after violent commotions of the mind; the danger is not very great, as there will be room for ſuitable medicines to take effect: But that which ariſes from draſtic purges, ſharp emetics, or cauſtic poiſons, kills quickly without ſpeedy aſſiſtance. This diſeaſe likewiſe often proves fatal to the old, the infirm, the ſcorbutic, and perſons full of grief, as alſo in the end of acute diſeaſes.

When there is a reſtleſs toſſing of the body; when liquids are immediately thrown up; when there is a hiccup, a fainting, an hippocratic face, an intermitting pulſe, and convulſions, a fatal mortification will ſoon terminate the patient's life.

This diſeaſe, if not ſuddenly cured, is generally mortal: And therefore, as ſoon as it is diſcovered, plentiful bleeding is neceſſary, and muſt be repeated as the violence of the ſymptoms increaſes. Let the drink be very ſoft, antiphlogiſtic, and emollient; as alſo clyſters of the ſame kind.

The patient ſhould totally abſtain from every thing that is acrimonious; even the cooling, nitrous ſalts, which are beneficial in other inflammations, irritate too much. Vomits, cordials, and ſpirituous liquors, are little better than poiſon.

Aliments ſhould be given frequently, and by a ſpoonful at a time; for any diſtention increaſes the inflammation. A thin gruel of barley, oatmeal, whey, with very little ſugar or honey, or chicken-broth, are proper aliments; whey-emulſions, barley-water, emollient decoctions, are proper drinks.

The indications of cure are, 1. To open the obſtructions cauſed by tenacious juices impacted into incongruous veſſels; 2. To remove the ſpaſtic ſtrictures which contract the veſſels, and to reſtore the equable and natural progreſs of the blood through the ſubſtance of the ſtomach. Theſe ends are to be obtained by *diluents*, *humectants*, *demulcents*, *antiſpaſmodics*, and things that reſtrain the heat which thickens the fluids, and relax the conſtricted fibres.

But as there are more cauſes than one that produce an inflammation, they will require different remedies to bring about a cure.

Therefore, if it be owing to a cauſtic, ſeptic, arſenical poiſon, or a ſtrong emetic or cathartic, or to metallic medicines ill prepared, and thence the inflammation; oily fat things are proper, as new milk, cream, oil of ſweet almonds, or olive oil taken often and plentifully.

If from a ſpaſm, ſucceeding a violent commotion of the mind, then a nitrous abſorbent powder will be proper, in an emulſion of white poppy ſeeds. When the ſpaſm is appeaſed, rhubarb with raiſins will be neceſſary to carry off the bilious ſordes.

When an eruptive matter is repelled and cauſes this diſeaſe, uſe emulſions of the greater cold ſeeds, with temperate bezoardic powder; now and then adding a little nitre and a ſmall matter of camphire.

If from a cauſtic bile, as in the cholera morbus, an inflammation is apprehended, earthy abſorbents and hartſhorn philoſophically prepared ſhould be given, with gelatinous decoctions of calves and neats feet, or hartſhorn-jellies.

jellies and water-gruel. Outwardly, the following liniment is useful in all cases:

Take of oil of sweet almonds 2 ounces, and a dram of camphor; mix and make them into a liniment, to be applied warm to the stomach.

Of the QUINSEY.

A QUINSEY is an inflammation of the fauces, with a burning pain, tumor and redness; a difficulty of breathing or swallowing; and a fever, proceeding from a stasis of blood, or a viscid acrid serum in the sanguineous or lymphatic vessels.

It begins with a fever, which is followed with a pain and inflammation of the fauces, causing the uvula, tonsils, and larynx to swell; whence great difficulty of breathing and swallowing ensues.

This disease may be seated at the root of the tongue near the *os hyoides;* the *foramina* of the nostrils opening to the bone; the beginning of the *œsophagus*; the muscles of the pharynx; the internal and external muscles of the larynx; the greater and lesser glands; the tonsils, or the muscles moving the jaws.

When a quinsey affects the internal muscles of the larynx, and there is no outward redness about any part of the neck, but a burning pain inwardly, a loss of voice, and great difficulty of breathing; it often kills in twenty-four hours. This is called a *kynanche* When it is seated in the internal muscles of the pharynx, it is called a *synanche;* in which there is no external tumor and redness, but a great difficulty of swallowing and breathing, and whatever is drank returns through the nose. When there is an outward tumor and redness, and the external muscles of the pharynx are affected, it is a *parasynanche;* when the external muscles of the larynx, a *parakynanche.*

A quinsey is likewise distinguished into the true and spurious. The true arises from the stasis of the blood; the spurious or bastard from a congestion of the serum. The former is acute, always attended with a rigor and a fever. The latter has rather a lymphatic or catarrhal, than an acute fever. The first has not only a burning, pricking pain in the inner parts of the fauces, but the tongue is turgid with blood, and of a dark reddish colour; the face is likewise red; there is a great pulsation of the temporal arteries; sometimes a head-ach, a torpor of the senses; sometimes fainting.

When it is very violent, there is a difficulty of breathing, high anxiety, and coldness of the extremities; and is very dangerous, requiring speedy help. But in the spurious, those symptoms are either absent, or more mild; nor is the danger so great.

This disease may be caused by a suppression of some usual sanguineous evacuation; by admitting the cold air after a strong sudorific has been taken; and by lying in rooms new plaistered or white-washed. Some caustic poisons affect the throat more than other parts. White hellebore attacks the fauces, and brings on a strangulation. The same ensues from the *solanum furiosum,* and the bite of a mad dog. The fumes of arsenical and mercurial minerals, as also the vapours of mineral spirits, will have the same effects.

It sometimes comes on spotaneously, and is again the symptom of another disease, as the diarrhœa and dysentery, especially if the flux is hastily stopped. It has happened from the striking in of an erysipelas; or sometimes from the gout being injudiciously treated with topicks; as also from the small-pox, or a malignant or pestilential fever. The cause of the symptomatic disease is costiveness, or suppressed perspiration, or the striking in of eruptions. When it is epidemic, it has something of malignity.

When the swelling, pain, and redness, appear more outwardly, and vanish by degrees, it is a sign of a happy solution of the disease. But when the external swelling suddenly disappears, without a mitigation of the symptoms, it shews the morbific matter to be translated elsewhere, and will change to a phrenzy or peripneumony. Or this disease may terminate in a suppuration or gangrene, or a schirrus. A frothing at the mouth, the tongue vastly swelled, and of a purple, blackish colour, portend death.

In these inflammations a slight diarrhœa relieves: Therefore aliments which promote it are useful, as tamarinds infused in whey; decoctions of farinaceous vegetables moderately acidulated, and such as abound with a cooling nitrous salt, are proper. Burnet is said to be a specific in this case. Mulberries are beneficial, and all acids.

The mouth and throat must be kept moist, and the nose clear, that the air may have clear passage through it. When the patient cannot swallow, he may be nourished by clysters.

Take away blood plentifully from the arm, and afterwards open a sublingual vein; but bleeding in the jugular yields the best assistance, and is much more safe. If the symptoms continue to be very urgent, the bleeding may be repeated in six or eight hours time, till they begin to be more mild.

After the first bleeding, lay a strong and large blister on the fore-part of the neck, or a piece of flannel dipt in the volatile liniment.

Then let the parts inflamed be touched with the following mixture:

1. Take a sufficient quantity of honey of roses and spirit of sulphur. Mix them.

Then the following gargle is to be used, held in the mouth till it is hot before it be spit out; which is to be repeated pretty often:

2. Take a pound of barley-water, 8 ounces of honey, and 2 drams of spirit of sal armoniac. Mix them.

Emollient steams, or even the steam of hot water taken in at the mouth, are beneficial.

If the patient is not able to swallow any nourishment,

3. Take ten ounces of beaf-tea, 10 grains of nitre, and 6 drops of spirit of salt. Mix and make them into a clyster.

Let it be injected every eighth hour, after the belly has been cleansed with a purging clyster.

If the tumour tends to a suppuration, it is best promoted by holding fat, dried figs in the mouth; and when the tonsils are full of an inflammatory ichor, honey of roses mixt with spirit of vitriol, and often applied to the part with a pencil, is excellent.

That

That inflammatory pain which arifes from a fharp falt ferum in the glandulous parts of the fauces, with rednefs, and a copious flux of faliva, but without a fever, may be cured with a gargle of brandy alone. An inflammation of the fauces is fometimes cured with ten drops of camphorated fpirit of wine, in which a grain of nitre has been diffolved, and fuffered to pafs flowly down the throat.

The acute and inflammatory quinfey may be defined, "An inflammation of fome part or parts, either within or "contiguous to the throat, rendering deglutition painful, "or impracticable; and, when it is of the moft dangerous "kind, likewife affecting refpiration."

When only fwallowing is impaired, the parts inflamed may be the tonfils, the velum palati, and uvula, the mufcles of the pharnynx, and thofe of the larynx, which raife it or pull it down in deglutition, but whofe action is not concerned in moderating the aperture of the glottis; while the larynx itfelf and the afpera arteria remain free.

But when the refpiration is pinched, befides other parts, thefe mufcles, which are employed in opening and fhutting the glottis, muft be inflamed; and likewife, probably the inner membrane of the larynx, and thofe mufcles and fibres that join the rings of the afpera arteria together: And fometimes thefe minute and remote parts are affected without any rednefs or tumour, either within the fauces, or outwardly on the throat: This kind of quinfey is the moft dangerous and fuddenly deftructive of all.

The practitioner in every kind of quinfey ought to look carefully into the mouth and fauces, in order to difcern where any rednefs and tumour is; that by comparing the appearance of the parts with the functions impaired, he may be enabled to form the better judgment with refpect to the feat of the difeafe, the prognoftic, and method of cure.

If the breathing is remarkably affected, there is abfolute neceffity of applying all the moft efficacious remedies with the greateft brifknefs and fpeed poffible. Thefe are plentiful and repeated bleedings, a large blifter between the fcapulæ; fomentations and cataplafms outwardly; fteams to be received into the throat, the beft ingredient in which is vinegar; fmart, but cooling purges; or, if thefe cannot be got down, clyfters of the fame kind; bathing the feet and legs in warm water, and even femicupia not made too hot, for fear of raifing the pulfe too high.

But even though the refpiration fhould not be affected at firft, if the fymptoms are otherwife violent, remedies ought to be fmartly and quickly applied to prevent fuppuration. For when the inflamed part tends to fuppuration, the tumour keeps increafing: and when the pus is actually formed, the bulk may be fo enlarged as to endanger fuffocation, or the patient may be ftarved by a total privation of fwallowing; fo that fuppuration fhould always be prevented, if poffible.

If in the courfe of the diftemper the patient fhould run a rifk of being fuffocated, the operation of bronchotomy becomes neceffary. See SURGERY.

Of the Malignant QUINSEY, *or* Putrid SORE THROAT.

THIS difeafe generally comes on with fuch a giddinefs of the head, as often precedes fainting, with a chilnefs or fhivering like that of an ague fit, followed by great heat; and thefe alternately fucceed each other for fome hours, till at length the heat becomes conftant and intenfe. The patient then complains of an acute pain in the head, of heat and forenefs, rather than pain, in the throat; ftiffnefs of the neck; commonly great ficknefs, vomiting or purging, or both. The face foon after looks red and fwelled, the eyes inflamed and watery, as in the meafles; with reftleffnefs, anxiety, and faintnefs.

It frequently feizes the patient in the fore-part of the day; and as night approaches the heat and reftleffnefs increafe, continuing till towards morning; when after a fhort, difturbed flumber, the only repofe during feveral nights, a fweat breaks out, which mitigates the heat and reftleffnefs, and gives the difeafe fometimes the appearance of an intermittent.

If the mouth and throat be examined foon after the firft attack, the uvula and tonfils will appear fwelled; and thefe parts together with the velum pendulum palati, as well as the cheeks on each fide, near the entrance into the fauces, aud as much of the fauces and the pharynx behind as can be feen, appear of a florid red colour. This colour is commonly moft obfervable on the pofterior edge of the palate, in the angles above the tonfils, and upon the tonfils themfelves. Inftead of this rednefs, a broad patch, or fpot, of an irregular figure, and of a pale white colour, furrounded with a florid red, is fometimes to be feen. This whitenefs is commonly like that of the gums after having been preffed with the finger; or as if a matter ready to be difcharged lay underneath.

Generally on the fecond day, the face, neck, breaft, and hands, are of a deep eryfipelatous colour, with a fenfible tumefaction. The fingers are fo frequently tinged in a remarkable manner, that it has been no hard matter to guefs at the difeafe from a bare fight of them.

A great number of fmall pimples of a more intenfe colour than that which furrounds them, appear on the arms and other parts. Where the rednefs is leaft intenfe, they are larger and more prominent, which is generally on the arms, breaft, and lower extremites.

As the fkin becomes red, the ficknefs commonly goes off, and the vomiting and purging ceafe.

The appearance in the fauces continues the fame, only the white place becomes of a more opake white, and is difcovered to be a flough, concealing an ulcer of the fame dimenfions. Thefe ulcerations are generally firft difcernible in the angles above the tonfils, or on the tonfils themfelves. They are alfo often feen in the arch formed by the uvula and one of the tonfils; on the pharynx behind, on the infide of the cheeks, the bafis of the tongue, which they cover like a thick fur. Where the diforder is mild, there is only a fuperficial ulcer, of an irregular figure, in one or more of thofe parts, fcarce to be diftinguifhed from the found part, but by the inequality of its furface. Likewife the rednefs and eruption do not always appear, and in fome not till the third, fourth, or fifth day, or later.

The parotid glands on each ſide commonly ſwell, grow hard, and are painful to the touch; If the diſeaſe is violent, the neck and throat are ſurrounded with a large œdematous tumour, ſometimes extending itſelf to the breaſt, and by ſtraitening the fauces increaſe the danger.

Towards night the heat and reſtleſſneſs increaſe, and a delirium frequently comes on. This happens to ſome on the firſt night. It is very remarkable, that the patient commonly returns a proper anſwer to any queſtion, but with unuſual quickneſs; yet when they are alone, they generally talk to themſelves incoherently. However, at the firſt tendency to this diſorder, they affect too great a compoſure. This for the moſt part happens to thoſe that ſleep but little; for ſome are comatoſe and ſtupid, and take but little notice of any thing that paſſes.

They continue thus for three, four, or more days, commonly growing hot and reſtleſs towards the evening. Theſe ſymptoms and the delirium increaſe as the night comes on: a ſweat, more or leſs profuſe, breaks out towards morning; and from this time they are eaſier during ſome hours, with a faintneſs, which is their chief complaint.

Some grow eaſier from the firſt day of the attack; others have ſymptoms of recovery on the third, fourth, or fifth day. Firſt the redneſs of the ſkin diſappears; the heat grows leſs; the pulſe, hitherto very quick, becomes ſlower; the external ſwellings of the neck ſubſide; the ſloughs in the fauces are caſt off; the ulcerations fill up; the patient ſleeps without confuſion, is compoſed when awake, and his appetite begins to return towards more ſolid nouriſhment.

The pulſe, during the courſe of this diſeaſe, is very quick, beating frequently 120 times in a minute. In ſome it is hard and ſmall, in others ſoft and full, but not ſo ſtrong and firm as in genuine inflammatory diſorders.

If a vein be opened ſoon after the diſtemper comes on, the blood generally appears of a freſh and florid red; the *craſſamentum* is rather of a lax, gelatinous contexture, then denſe or compact; the ſerum is yellow and in a large proportion.

The urine is at firſt crude and of a pale whey colour; as the diſeaſe advances it turns yellower, as if bile was diluted in it; and ſoon after any ſigns of recovery appear, it commonly grows turbid, and depoſites a farinaceous ſediment.

They ſeldom have any ſtools if the ſymptoms are favourable, from the time the purging, which generally attends the acceſſion, ceaſes. This diſcharge is remarkably bilious, yet without pain.

The thirſt is commonly leſs than in other acute diſeaſes; and the tongue generally moiſt, but not furred. Some have it covered with a thick white coat, and complain of foreneſs about the root of the tongue

Though the uvula and tonſils are ſometimes ſo much ſwelled as to leave a very narrow entrance into the gullet, and this entrance frequently ſurrounded with ulcers, or ſloughs; yet the patient ſwallows with leſs difficulty and pain than might be expected. Soon after they are taken ill, they frequently complain of an offenſive putrid ſmell, which often occaſions ſickneſs before any ulcerations appear. The inſide of the noſtrils, in thoſe that have this diſeaſe ſevere, frequently appears, as high as can be ſeen, of a deep red or almoſt livid colour. After a day or two, a thin corroſive ſanies, or with it a white putrid matter, of a thicker conſiſtence, flows from it, ſo acrid as to excoriate the part it lies upon any conſiderable time. This is moſt obſervable in children, or in young and very tender ſubjects; whoſe lips are likewiſe frequently of a deep red, or almoſt livid colour, and covered on the inſide with veſicles containing a thin ichor, which excoriates the angles of the mouth and cheeks where it touches them.

This acrid matter ſeems to paſs with the nouriſhment into the ſtomach, eſpecially of children; for if they get over the diſeaſe, a purging ſucceeds, yet attended with ſymptoms of ulcerations in the bowels: theſe, after great pain and miſery, at length die emaciated.

The patients ſometimes bleed at the noſe towards the beginning of the diſeaſe; and the menſes often appear in the female ſex, if they are of age, ſoon after they are ſeized, though at a diſtance from the time of their regular period. It brings this evacuation upon ſome that never had it before. This flux, in full ſtrong habits, is ſeldom attended either with benefit or with manifeſt ill effects, unleſs very copious; yet ſometimes it occaſions great faintneſs, and an increaſe of the other ſymptoms. Hæmorrhages of the noſe and mouth have carried the patient off ſuddenly: but this does not happen till ſeveral days after the attack; and perhaps may be owing to the ſeparation of a ſlough from the branch of an artery.

Children and young perſons are more expoſed to this diſeaſe than adults; girls more than boys; women more than men; and the infirm of either ſex than the healthy and vigorous. Very few grown people have it. When it breaks out in a family, all the children are commonly infected with it, if the healthy are not kept apart from the ſick. And ſuch adults as are frequently with them, and receive their breath near at hand, often ungergo the ſame diſeaſes.

With regard to the cure, bleeding is generally prejudicial. Some admit of it at the firſt attack without any ſenſible inconvenience; but a repetition of it in the mildeſt caſes ſeldom fails to aggravate the ſymptoms; it has ſometimes produced very fatal conſequences. It increaſes the heat, reſtleſſneſs, delirium, and difficulty of breathing; nor do the ſwelling of the fauces, tonſils, *&c.* receive any benefit therefrom. On the contrary, though the fullneſs of theſe parts decreaſes, yet the ſloughs thicken and change to a livid black colour, the external tumour grows large, and the ſpitting commonly diminiſhes. Indeed, the heat and quickneſs of the pulſe may ſeem to abate at firſt by this evacuation; but they commonly return with greater violence, the patient is ſeized with a difficulty of breathing, falls into cold ſweats, a ſtupor, and dies ſuddenly.

Nor is purging more beneficial; even gentle cathartics have brought on very dangerous ſymptoms. Upon procuring a few ſtools with manna, eſpecially when the diſeaſe has continued two or three days, the redneſs of the ſkin has diſappeared, and the flux to the throat has been ſurpriſingly increaſed. If this diſcharge by ſtool continues,

tinues, the ſwelling of the neck commonly grows larger, the fauces become flaccid, dry and livid; and the patient a few hours after this expires.

Nitrous cooling medicines frequently produce the like effects; they increaſe the faintneſs which accompanies this diſeaſe, and either diſpoſe the patient to copious ſinking ſweats, or ſtools.

Upon the whole, it appears, that all evacuations which tend to leſſen the natural ſtrength of the conſtitution, are injurious; and thoſe perſons are commonly in the greateſt danger who have been previouſly indiſpoſed, or their ſtrength impaired by grief.

If the purging, therefore, continues long after the firſt exacerbation of the diſeaſe, it is a dangerous ſymptom; for though it may ſometimes be reſtrained for the preſent with opiates or aſtringents, yet it commonly returns with greater vehemence when their efficacy ceaſes, and in a ſhort time exhauſts the ſmall degree of ſtrength remaining. In this caſe they generally ſweat very little; the fauces appear dry, gloſſy, and livid; the external tumour grows large; they void their excrements without perceiving it, and fall into profuſe ſweats; the reſpiration becomes difficult and laborious, the pulſe ſinks, the extreme parts grow cold, and death, in a few hours, cloſes the ſcene. The eye loſes its luſtre, and becomes opaque and dim, ſometimes ſeveral hours before death.

A copious flux of pituitous matter to the glands and other parts about the fauces, have ſeemed ſometimes to be the cauſe of ſudden death.

It is neceſſary that the patient ſhould be kept in bed as much as may be, though the diſeaſe ſhould ſeem to be ſlight; for a purging has come on for want of care in this reſpect, the redneſs of the ſkin diſappeared, and a diſorder which with confinement alone would probably have gone off in twice twenty-four hours, has been rendered tedious and difficult.

At the firſt, while the ſickneſs and vomiting continue, it will be beſt to promote the diſcharge, by giving an infuſion of green tea, camomile flowers, carduus, or a few grains of ipecacuanha.

If the ſymptoms do not abate by this means, give ſmall draughts of mint-tea, with a ſixth part of red port, frequently, together with ſome warm and cordial aromatic medicine, every four or ſix hours.

The diarrhœa, as well as vomiting, generally ceaſes in leſs than twelve hours from the firſt attack: If it continues longer, it is neceſſary to check it; otherwiſe it occaſions great faintneſs, ſinks the ſtrength, and in the end produces dangerous conſequences. The aromatic cordials commonly take off this ſymptom, if given plentifully, and the vomiting likewiſe.

Patients generally complain of an exceſſive faintneſs ſoon after they are taken ill. The urgency of this ſymptom ſeems to indicate the degree of danger; and an abatement of it is a pretty ſure preſage of recovery. Aromatic medicines are likewiſe found uſeful in removing this ſymptom. Wine may be given in ſmall quantities in whey, or mint, baum, or ſage-tea, barley-water, gruel, panada, ſago, and the like; for it is not only an antiſeptic, but a generous cordial. When the faintneſs is exceſſive, it may be given alone.

Bliſters likewiſe relieve faintings; they may be applied with advantage to the uſual parts, and to the neck on each ſide, from below the ear almoſt to the clavicle, as occaſion requires.

With regard to the ulcers, which demand our early and conſtant attention: When the diſeaſe is of the mildeſt kind, only ſuperficial ulceration is obſervable, which may eſcape the notice of a perſon unacquainted with it. A thin, pale, white ſlough ſeems to accompany the next degree; a thick, opake, aſh-coloured one is a farther advance; and, if the parts have a livid or black aſpect, the caſe is ſtill worſe. Theſe ſloughs are real mortifications of the ſubſtance; ſince, whenever they come off, they leave an ulcer of a greater or leſſer depth, as the ſloughs are ſuperficial or penetrating.

The thin, acrid ichor, which is diſcharged from under the ſloughs, often proves of bad conſequence, eſpecially to children. If gargles are injected, they either prevent them from reaching the ſeat of the diſorder with their tongues, or they ſwallow them and the putrid taint of the ulcers together; whence fatal purgings enſue, or fatal hæmorrhages from the penetrating gangrene. Thoſe that have a plentiful diſcharge from the fauces, carrying off this ichor, are ſeldom attended with ſickneſs, vomiting, or exceſſive faintneſs; and where there is little or no diſcharge, the ſymptoms are commonly moſt dangerous.

Hence the great advantage of gentle ſtimulating aromatic gargles appears; becauſe they promote the diſcharge of pituitous matter, and, doubtleſs, ſome part of the corroſive fluid along with it. To which, if we add antiſeptics and detergents, to check the progreſs of the mortification, and to cleanſe the ſordid ulcers, every indication will be anſwered.

When the diſeaſe is mild, the ſymptoms favourable, the ſloughs ſuperficial, order a gargle of ſage-tea, with a few roſe-leaves in the infuſion. Three or four ſpoonfuls of vinegar may be mixed with half an ounce of the tea, with as much honey as will make it agreeably acid.

If the ſloughs are large, and are caſt off ſlowly, they may be touched with mel ægyptiacum, by means of an armed probe.

It is not uncommon for hectic heats, night ſweats, want of appetite, and dejection of ſpirits, to attend thoſe a conſiderable time who have had the diſeaſe in a ſevere manner. Aſſes milk commonly relieves them, together with a decoction of the bark and elixir vitrioli.

The cauſe of this diſeaſe ſeems to be a putrid virus, or *miaſma ſui generis*, introduced into the habit by contagion, principally by means of the breath of the ſick perſon.

The intentions of cure in this diſeaſe is to keep up the *vis vitæ*; to encourage the cuticular diſcharges; and to conquer the ſpreading putrefaction. Therefore, all evacuations which leſſen the ſtrength, particularly bleeding and purging, and all the nitrous antiphlogiſtic medicines, are highly improper.

And ſince a laxity of fibres prediſpoſes perſons to receive this diſeaſe, it is manifeſt, both with regard to the preſervation and cure, tonic medicines are indicated; and among thoſe the bark juſtly claims the firſt place.

The

The only certain diagnoſtics of this diſeaſe are aphthous ulcers and ſloughs on the tonſils and parts about the pharynx.

Moſt perſons in the beginning have a nauſea and vomiting, and ſome a looſeneſs. Thoſe who are coſtive, have, upon the uſe of the gentleſt eccoprotics, immediately been ſeized with a diarrhœa, difficult to reſtrain. All medicines which tend to move the belly, not excepting rhubarb, are extremely dangerous.

Thoſe who have had the diſeaſe with moſt violence, have had the head always heavy and ſtupid, and the eyes foul and full of tears. Not a few have had the head covered with petechiæ and purple ſpots.

The firſt thing to be done is to order the hot ſteam of a boiling mixture, of vinegar, myrrh, and honey, to be received into the throat, through an inverted funnel. If it is neceſſary to make it ſtill more penetrating, add ſome of the *ſpirit. Mindereri.* This ſteam can ſcarce be uſed too frequently, provided it is received with a due degree of heat.

If the *primæ viæ* ſeem foul, or much loaded, it may be neceſſary to begin the cure by cleanſing the ſtomach with carduus tea, in which a little ſal vitrioli is diſſolved, and ſome other gentle and quick emetic. No other evacuation ſeems proper, and this is only to be uſed at the very beginning of the diſeaſe. If the phyſician is not called in ſoon enough, it will be neceſſary to begin immediately by giving the bark, joined with the *ſpir. Mindereri.*

The bark is moſt efficacious in ſubſtance; but when the ſtrength of the patient is much reduced, and the digeſtive powers weakened, which is uſual in putrid fevers, on the very firſt ſeizure, the decoction or extract may be thought preferable; but this laſt is ſeldom to be had genuine. In making the decoction, it ought to be done with as gentle a heat as poſſible, and then evaporate very ſlowly to procure the extract, leſt it be burnt too, and that the volatile parts may fly off as little as may be.

In the uſe of the *ſpiritus Mindereri*, care ſhould be taken that it be exactly neutralized; or rather, as the diſeaſe is putreſcent, that it may incline towards the acid. This is particularly of uſe where the heat is very great, it being very attenuating and antiſeptic.

When the putrefaction is ſufficiently conquered, it will be neceſſary to cleanſe the firſt paſſages with a ſmall doſe of rhubarb; which is to be repeated at proper intervals, continuing the bark, *&c.* on the intermediate days for a conſiderable time.

To complete the cure, the patient ſhould enter into a courſe of balſamics, chalybeate waters, with elixir vitrioli, and the like, in order to ſtrengthen the ſolids and invigorate the blood; for this diſeaſe is liable to return, eſpecially if they have afterwards a fever of the putrid kind.

Of a PHRENZY.

A PHRENZY, if a primary diſeaſe, is a true inflammation of the dura and pia mater; if ſymptomatical, the inflammatory matter is tranſlated into the meninges of the brain from ſome other part.

The primary phrenſy is preceded by heat and a violent inflammatory pain within the head, a redneſs of the eyes and face, unquiet and troubled ſleep, a ſlight degree of folly, watching, ſadneſs, fierceneſs, ſudden forgetfulneſs, a gathering of threads from the bedcloaths.

A ſymptomatic phrenſy ſucceeds any acute diſeaſe; but it is worſt when it is preceded by an inflammation of the pleura, lungs, or diaphragm. A black tongue, an obſtinate coſtiveneſs, ſuppreſſion of urine, white fæces, which is always a fatal ſign, pale, diſcoloured, thin urine, a wildneſs in the looks and actions, with a red viſage, a black cloud in the urine, and watching, are ſigns of an approachnig inflammation in the head.

The ſymptomatic phrenſy ſometimes appears in the ſtate of malignant, eruptive, and ſpotted fevers, the ſmall-pox, malignant catarrhal fevers, camp-fevers, particularly the Hungaric. It generally ſupervenes about the critical days, with a rigor, trembling of joints, tenſion of the præcordia, and coldneſs of the external parts, with thin urine. The patient being weakened with the preceding diſeaſe and long watching, which debilitates the tone of the veſſels of the membranes of the brain; whence the ſtaſes are not to be reſolved, and whence the patient is generally killed on the third day.

A phrenzy is to be diſtinguiſhed from that ſlight alienation of mind which happens in acute fevers before the critical eruption. This goes off readily, nor is the urine thin and watery, nor is it attended with a rigor and a refrigeration of the external parts. It is alſo to be diſtinguiſhed from a deſipience and raving, from a great loſs of ſtrength and weakneſs of the brain after the declination of an acute fever; for this will go as the ſtrength returns, either ſpotaneouſly, or with proper remedies.

Both kinds, when preſent, have the following ſymptoms:

A deprivation of the ideas of ſenſible things, as alſo of the faculties of the mind and affections; an unruly fierceneſs and wildneſs; an unquiet and often turbulent ſleep, a reſpiration ſlow and great, the face often exceeding red, the aſpect grim, the looks fierce, the eyes wild and protuberant, a dropping of the noſe.

A phrenzy is generally fatal on the third, fourth, or ſeventh day; which laſt it ſeldom exceeds.

When it does, and is violent, it often ends in madneſs; which increaſing gradually, the patient becomes raving mad.

The aliment ought to be ſlender, of farinaceous ſubſtances, as water-gruel acidulated; the drink, barley-water, ſmall-beer, or the decoction of tamarinds.

This diſeaſe, of all others, requires the ſpeedieſt applications. Profuſe hæmorrhages of the noſe often reſolve it; and copious bleeding, by opening the temporal arteries, is the moſt efficacious remedy.

The cure of this diſeaſe requires diligent attention to the following things:

Varices of the veins, or the bleeding piles, are beneficial.

A looſeneſs is likewiſe good.

A pain in the breaſt and feet, or a violent cough ſupervening, often put an end to the diſeaſe; as alſo an hæmorrhage.

Therefore plentiful bleeding is neceſſary, through a large

large orifice; or open ſeveral veins at the ſame time, *viz.* the *jugular*, the *frontal*, and a vein in the foot.

Hoffman prefers the bleeding at the noſe, procured by thruſting up a ſtraw, a pen, or a ſkewer; or, as Pringle adviſes, apply ſix or ſeven leeches to the temples. The reſt of the cure conſiſts in bliſters, and things common to other inflammatory fevers.

The cure of the ſymptomatic phrenzy, if the pulſe will bear it, is by opening a vein; but if this cannot be done by reaſon of great lowneſs, it is to be attempted by leeches and bliſters. It is uſual to begin with bliſtering the head, but in military hoſpitals that is to be left to the laſt. The beſt itnernal medicines are nitre and camphor. Hoffman's proportion is ſix grains of nitre to one of camphor; ſmall doſes of which are to be often repeated.

The patient's drink ſhould be ſweet whey, or acidulated by turning the milk with citron or lemon juice, and ſweetened with *ſyr. e meconio.* To every quart add a dram of purified nitre or ſal prunella. Alſo emulſions are convenient, of the four cold ſeeds, with barley-water, to every quart of which add two ſcruples of nitre.

Antiphlogiſtic clyſters are likewiſe proper: but if all theſe means fail, recourſe muſt be had to cupping in the lower parts, to opiates, and mild bliſters.

Of the Pleurisy.

The pleuriſy is moſt predominant between the ſpring and the ſummer.

It begins with chilneſs and ſhivering, which are ſoon ſucceeded by heat, thirſt, inquietude, and the other common ſymptoms of a fever.

After a few hours the patient is ſeized with a violent pricking pain in one of his ſides, about the ribs; which ſometimes extends itſelf towards the ſhoulder-blades, ſometimes towards the back-bone, and ſometimes towards the fore-parts of the breaſt; and this is attended with frequent coughing.

The matter which the patient ſpits at firſt is little and thin, and mixed with particles of blood; but as the diſeaſe advances, it is more plentiful and more concocted, but not without a mixture of the blood.

The fever keeps an equal pace with the cough, pain, and ſpitting of blood; and in proportion as the expectoration becomes more free, it ſenſibly decreaſes; ſometimes the body is coſtive, ſometimes too open.

The blood drawn from a vein, as ſoon as it is cold, looks like melted ſuet.

In this diſeaſe the pulſe is remarkably hard, and ſeems to vibrate like a tenſe ſtring of a muſical inſtrument, which is the pathognomonic ſign.

Hence pluriſies are diſtinguiſhed into the moiſt and the dry. It is likewiſe obſervable, that the pain in the ſide is more intenſe at the time of inſpiration, but more mild at the time of exſpiration.

There is no fever wherein the criſes are more regular than in the pleuriſy and peripneumony: for in young perſons, and thoſe of a full habit of body, bloody ſpittle generally appears on the fourth day, and on the ſeventh the diſeaſe terminates by a profuſe ſweat. But in the phlegmatic and more inactive, as alſo thoſe in whom the diſeaſe has taken deeper hold of the lungs, it will continue till the eleventh or fourteenth day; going off partly by expectoration, partly by ſweat: then the pulſe becomes more ſoft, and the patient falls into an eaſy refreſhing ſleep.

But when on critical days the criſis is imperfect there is indeed a ſweat; but it neither eaſes the patient, nor terminates the diſeaſe. When it continues till the twenty-firſt day, there is reaſon to fear a dangerous abſceſs in the breaſt. It is therefore a good ſign when the expectoration proceeds from the bottom of the lungs, bringing up a viſcid matter on the fourth day, mixed with blood, afterwards yellow, and ſometimes purulent. The ſooner the expectoration happens, the greater the hopes of recovery.

A looſeneſs is not ſafe; urine without a ſediment is a ſuſpected ſign; and a profuſe ſweat, unleſs on critical days, is ſtill worſe. On the eleventh and twelfth days a looſeneſs is not much to be feared, unleſs too great, for it ſometimes carries off purulent matter. If a bleeding at the noſe happens about the fourth day, it is generally attended with a remarkable alteration of the diſeaſe.

Thoſe who die of an inflammation of the lungs are ſuffocated, becauſe the matter adhering to the veſicles and bronchial ducts cannot be coughed up.

In all inflammatory fevers, too hot a regimen is to be ſhunned, both with reſpect to the bedcloaths and the heat of the room; nor muſt the patient be expoſed to the cold air, nor drink things actually cold. Likewiſe all ſtrong ſudorifics, diuretics, and cathartics, are hurtful. Nor, if the patient has three or four ſtools, muſt the courſe of nature be ſtopped.

The Diet ſhould be cooling, relaxing, ſlender, and diluting. Moiſtening things taken warm are preferable to all others. Hence, barley oroat meal gruel, ſweetened with honey, is proper; as alſo ſweet whey.

The indications of cure are, 1. To prevent the farther ſtaſis and ſtagnation of the blood. 2. To dilute and diſſolve the lentor of the blood in pleuritics. 3. To mollify, eaſe, and relax the ſpaſm, pain, and copious afflux, in order to put the impacted blood again into motion by the help of the appulſe of the arterial blood. 4. To promote the excretion of the viſcid, bloody, and vurulent matter, adhering to the bronchia of the lungs, ſo that it may be brought up and an abſceſs prevented.

Take away ten ounces of blood on the ſide of the part affected. If the phyſician is called before the third day, the patient lying on his back, muſt loſe a large quantity of blood from a wide orifice in a large veſſel, and fetch deep ſighs, or cough, to promote its celerity; and the part affected ſhould be rubbed gently at the ſame time. The bleeding ſhould be continued till the pain remits, or the patient is ready to faint. It ſhould be repeated as often as the ſymptoms return which it was intended to remove. The abſence of the white inflammatory pellicle from the ſurface of the blood, when cold, ſhews it is time to leave it off. This Huxham confirms by his own experience; and adds, that after the fourth day bleeding is not ſafe. He likewiſe recommends fomenting the part; which often eaſes the pain, and terminates the diſeaſe. But if it is obſtinate, he recommends ſlight ſcarifications; then cupping; and

and afterwards a blifter on the fame place, which has been fuccefsful when the ufual methods failed. An emollient cooling clyfter fhould immediately fucceed bleeding, efpecially if the body is coftive; and nitrous medicines, with a cooling, emollient, diluting regimen, fhould be forthwith entered upon. Thin whey, a decoction of barley and red poppies, and emulfions, will ferve for drink.

Though the fymptoms fhould vanifh on bliftering, it will be more fecure to bleed again; unlefs a profufe fweat comes on with relief from pain, and makes all other remedies unneceffary. But if the lungs are likewife inflamed, the cure cannot be fo fpeedy; for though the firft bleeding and a blifter fhould give eafe, yet a repetition will be needful. Sometimes the ftitch returns and fixes on the other fide; but this may be treated as the firft with the fame fuccefs.

Huxham lays a great ftrefs on camphor and nitre joined with fmall dofes of the paregoric elixir; and if there is a vehement pain, he thinks opiates may properly be joined with them, as they have a great power of relaxing the over tenfe fibres, of moderating the too rapid courfe of the blood, and of promoting the concoction of the morbific matter. Hence, after the ufe of opium, there is generally a copious fediment of the urine.

It is neceffary that the body be kept open, and the bowels free from fpafms; to which purpofes emollient clyfters are proper, with oil of fweet almonds.

In the firft ftage of the pleurify or peripneumony, laxative clyfters and the cooler diaphoretics are proper; but all cathartics and warm fudorifics do harm. The time for attempting the diaphoretics is when the perfon finds eafe by the blifter: But whenever the fpitting begins, the diaphorefis muft either be omitted, or joined to expectorants; whereof the chief is oxymel of fquills; or, in great heat or drought, fome more pleafant acid. But in lownefs, after repeated bleedings, give falt of hartfhorn joined to fome oil: This will raife the pulfe, and promote expectoration when it flags.

If, notwithftanding the difcharge, the breaft continues to labour, bleeding is ftill requifite: For the lungs are not to be overpowered by the omiffion of bleeding; nor is the fuppreffion of the fpitting to be hazarded by bleeding too freely. But with regard to blifters, there need little caution; as they are always feafonable, to raife, relieve the breaft, and to promote expectoration.

In the courfe of expectoration, a vomit will fometimes be ufeful in difcharging the load of vifcid phlegm. If the phlegm is tough, or the patient coftive, and opiates are given, they muft be joined with fquills.

When the pleurify ends in a fuppuration, or abfcefs, the figns are, a flight vague fhivering, which often returns without any evident caufe; a remiffion of the pain, while the difficulty of breathing remains; a rednefs of the cheeks and lips; thirft; a febricula, or flight fever, efpecially in the evening; a weak, foft pulfe.

When the abfcefs is actually formed, there is an obftinate dry cough, which increafes after feeding or motion; the breathing is difficult, fmall, thick, fhort, and wheezing, worfe after eating and motion; the patient can only lie on the fide affected; a flow, periodical fever, which is exafperated with ftirring and eating; a decayed appetite, great thirft, nocturnal fweats, palenefs, leannefs, and exceffive weaknefs.

This either ends in a confumption; or the matter falls into the cavity of the thorax, and fo becomes an empyema.

Of the Bastard Pleurisy.

Hoffman fays, that the feat of every genuine pleurify is in the lungs, as appears from the opening of thofe that die of this difeafe.

Therefore, if the inflammation occupies the externa parts only, it is a Bastard Pleurisy: if the externa furface of the lungs, like an eryfipelas, it is a genuine pleurify.

A Bastard Pleurisy is attended with a very acute and pricking pain in the fide, which is exafperated by the touch; lying on the affected fide is difficult; there is a dry cough, without the ejection of purulent or bloody matter, which, if ftrong, increafes the pain. There is likewife a fever, with a hardifh, depreffed, and frequent pulfe.

The caufe does not feem to be in the blood, but rather in the ftafis of an acrid ferum at the connection of the ends of the fine azygous arteries and veins; as alfo of the lymphatic veffels of the pleura, and likewife in the periofteum of the ribs, where the fenfe is more acute.

Hence it is nothing elfe but a kind of rheumatifm, and is common to thofe who are now and then troubled with catarrhs, rheumatic and arthritic pains, or a hemicrania; efpecially if they come out of a hot air into a cold, or the contrary, particularly in the evening.

This does not require bleeding, unlefs there is a remarkable plethora; but a diaphorefis, and a more free perfpiration. On the feventh day it generally difappears, and is without danger.

Lancifius advifes to bleed plentifully in the arm, and to fcarify the part affected. After this two cupping glaffes are to be applied thereto, which will cure the difeafe as if by enchantment.

Hoffman obferves, that thofe are apt to fall into a baftard pleurify who are much expofed to a moift cold autumnal or wintery air: For there are no difeafes or inflammatory fevers fo foon generated by the intemperies, inequality, and change of the air, as thofe of the breaft. When the fummer has been hot and dry, and the weather has fuddenly changed to cold, with a northerly wind, not only cartarrhal defluxions have enfued, but rheumatifms and pleurifies, with bloody fpittle and violent pains in the fide, have been very frequent. For the air, from continual infpiration, immediately affects the lungs internally, and externally the thorax and ribs, which are befet with thin mufcles, membranous nerves and veffels; for which reafon fpaftic crifpatures are readily induced, and the free circulation of the humours ftopt.

The beft way is to keep the part affected in a temperate and equal heat, in a warm bed; efpecially as the fkin of every patient, as in the gout and eryfipelas, cannot bear topics.

Of

Of a Peripneumony.

There are feveral kinds of this difeafe. For it may arife from a violent inflammation of the lungs, by a very fizy denfe blood obftructing very many of the pulmonic and bronchial arteries: or from an obftruction of the lungs by a heavy, vifcid, pituitous matter; which is called a fpurious or baftard peripneumony: or from a thin, acrid defluxion on the lungs; and then it is a catarrhal peripneumony.

The fymptoms common to all, are, a load at the breaft, a fhort difficult breathing, and more or lefs of a fever. But in a true peripneumony, there is a more tenfive pain than in the pleurify; befides, it is rather more obtufe and preffing than acute, and fhoots as far as the back and fcapulæ. But the difficulty of breathing is greater, as well as the anxiety and expectoration, whereby a variegated fpittle is brought up, which lay as it were deep: for in this difeafe the veffels of the lungs themfelves, whereby the blood circulates from one ventricle of the heart to the other, are affected; being ftuffed and obftructed with a thick blood, which is apt to grow more vifcid and folid. Wherefore it is the more dangerous and fatal, efpecially if it attacks old perfons, and if bleeding is not timely adminiftred. Boerhaave fays, the pulfe is foft, flender, and in every fenfe unequal; and Huxham, that if the pulfe is hardly felt before bleeding, it will afterwards beat very ftrongly.

In the cure, great regard muft be had to the different ftages of this difeafe, and the different fymptoms that attend it. Bleeding is indifpenfably neceffary at the beginning of a fevere inflammation of the lungs; but if, after the fecond or third bleeding, the patient begins to fpit a well concocted matter, freely tinged with blood, you muft forbear to repeat it, otherwife the patient will be weakened, and a fatal fuppreffion of the expectoration will enfue. But if he brings up a confiderable quantity of florid, thin, fpumous blood, by fpitting; then bleed again, quiet the cough with diacodium, and give proper acids pretty freely, with foft cooling incraffants. If a thin, gleety, dark-coloured matter is expectorated, it is generally a mark of greater malignity, and that the blood is in a putrefying diffolving ftate, and will not bear a large lofs of blood.

Generally the more violent the rigor or horror is at the attack, the more violent the fucceeding fever will be, which will in fome meafure guide us in drawing of blood. If the fymptoms are not relieved by the firft bleeding, after eight, ten, or twelve hours, let it be repeated; or fooner, if they become aggravated. If the fever, anxiety, oppreffion, and difficulty of breathing, increafe, bleed again, efpecially if it appears very firm and denfe, or covered over with a thick yellowifh coat or buff. However, it does not appear fometimes till the fecond or third bleeding, though the fymptoms indicate a very high inflammation. This often happens from the blood not fpouting out in a full ftream. This appearance of the blood, with a firm ftrong pulfe, will warrant the taking away more, till the breathing becomes free and eafy.

If the craffamentum is of a very loofe texture, and not covered with a buff coat, and the pulfe on bleeding finks, flutters, or grows more weak and fmall, it is time to defift. A bluifh film on the blood, with a kind of a foft greenifh jelly underneath, while the cruor itfelf is livid, loofe and foft, with a turbid, reddifh, or green ferum, is a fign of a very lax crafis of the blood, and great acrimony, which will not bear great quantities to be drawn off. If the blood is very florid, thin and loofe, with little or no ferum after ftanding for fome time, it generally argues a confiderable advance to a putrid and very acrid ftate.

A ftrong, throbbing, thick pulfe, always indicates farther bleeding; at leaft till the patient breathes more eafily, or a free expectoration of laudable matter is obtained. It often happens, that the pulfe at the very beginning feems obfcure and oppreffed, irregular, fluggifh, and fometimes intermitting, with weaknefs and oppreffion. But this does not arife from the defect, but from the too great quantity of blood; for the blood-veffels being over-loaded and diftended, cannot act with fufficient vigour. This is fucceeded with a dreadful train of fymptoms, and even death itfelf, if not prevented with fufficient bleeding.

In fome very violent peripneumonies, an immediate and exceffive weaknefs comes on, with an inexpreffible anxiety and oppreffion of the breaft; a very fmall, weak, trembling pulfe, coldnefs of the extremities, with clammy, coldifh, partial fweats, the eyes ftaring, fixed and inflamed, the face bloated and almoft livid. This has foon been followed with a ftupor, delirium, and fometimes with a complete paraplegia.

Some kinds of peripneumonies will not bear large bleeding, efpecially the epidemic or malignant. The pulfe and ftrength of thefe patients have funk to a furprifing degree; and the difeafe has turned into a fort of a nervous fever, with great tremors, fubfultus tendinum, profufe fweats, or an atrabilious diarrhœa, with a black tongue, coma, or delirium; though at the beginning the pulfe feemed to be full and throbbing, and the pain, cough, and oppreffion fo very urgent, as to indicate bleeding pretty ftrongly. In thefe cafes the blood was feldom buffy to any confiderable degree, but commonly very florid, of a very loofe and foft confiftence, or very dark-coloured, and coated with a thin and bluifh or greenifh film, under which was a foft greenifh jelly, and a dark livid cruor at the bottom. Sometimes the coat was much thicker and more tough, but of a pale red colour, refembling the cornelian ftone, or a dilute jelly of red currants. When the blood is thus diffolved, abftain from farther bleeding, efpecially if the pulfe or patient becomes more languid after it, though the oppreffion, load, or even pain, may feem to require it.

When the fizy coat on the blood is exceffively tough, and extremely yellow, or of a pale red colour, it threatens danger; for the inflammatory lentor will fcarcely mix with any diluents. Sometimes, after repeated bleeding, the craffamentum has fcarce been a fixth part of the volume of the blood, and yet as folid as a piece of flefh. This is generally mortal.

When the peripneumonic fymptoms continue for four or five days or more, we may juftly fear an abfcefs, or a mortification; and little advantage is to be expected from

farther

farther bleeding. But if the pain returns with violence after having ceased a considerable time, it is a sign that a new inflammation is forming, which indicates bleeding as much as the primary, but not in the same degree. The strength of the patient and pulse, the violence of the pain and difficulty of respiration, are, in a great measure, to determine the quantity. When the pulse and strength seem to require bleeding, cupping on the shoulders will relieve the breast and head. Likewise the use of blisters, issues, setons, are very serviceable in inflammations of the lungs.

Laying a blister on the part affected is the proper cure of a pleurisy; but a peripneumony is naturally more dangerous; and the more so as the epispastic cannot operate so directly on the lungs as the pleura. But even in this case, blistering is most to be relied on after bleeding. You may first blister the back, and afterwards one or both sides. Epispastics tend to relieve the breast, not only when applied to the chest, but also to the extremities; and promote expectoration: Whereas bleeding must be used cautiously, if at all, after the spitting appears.

The fever and the inflammation require a cool, diluting regimen, and nitrous and relaxing medicines; together with a moderately cool, free air, and quiet both of body and mind. A close room is very incommodious; if it cannot be avoided, it should be prudently aired. There is nothing more proper than thin whey, a barley ptisan with liquorice, figs, *&c.* the infusion of pectoral herbs, such as ground-ivy, maiden-hair, colt's-foot, hyssop, *&c.* These should be gently acidulated with juice of Seville oranges or lemons. Honey will render them more detergent. Any or all these things may be drank warm by turns in frequent small draughts, sipping them as it were perpetually. These relaxing, emollient drinks, and vapours arising from them, are in a more essential manner necessary, when the expectoration is very difficult and tough. When it is suddenly suppressed, and the difficulty of breathing greatly augmented, an emetic of oxymel of squills will be proper, if the violence of the fever is abated; but very little should be drank after it to promote vomiting.

When much sincere, florid, or frothy blood is spit up, take away as much blood immediately as the patient's strength will bear. If the hæmoptoe continues, bleeding in the saphœna will be found of the utmost service. Then direct cooling emulsions, nitrous, demulcent, and mucilaginous medicines; and vegetable and even mineral acids, if the spitting of blood is very considerable. The drink may be a decoction of red poppies, colt's-foot, and figs, acidulated with elixir of vitriol. The cough may be appeased with diacodium, or a soft linctus. But strong astringents and large doses of opiates are bad.

In a Catarrhal Peripneumony, the matter expectorated is extremely thin and crude, and the defluxion so very acrid as to excoriate the wind pipe, causing an incessant and very violent cough. Here, a great loss of blood is not necessary; but some should be drawn in the beginning to abate the inflammatory disposition. Blisters should be applied early, and purgatives are proper to carry off the serous colluvies. A demulcent, pectoral ptisan is proper to temperate the acrimony of the humours. It should be taken warm with mild diaphoretics. Coffee is a useful drink. Direct *diacodium*, or *elixir paregoricum*, to moderate the cough, in small doses often repeated; *sperma ceti*, *olibanum*, *myrrh*, and *camphor*, tend to incrassate the thin catarrhal humour, and abate the irritation.

In the Putrid Peripneumony the expectoration is livid, gleety, and sanious, frequently resembling the lees of red wine; sometimes more black, and sometimes very fetid. This is often the case of the highly scorbutic; particularly sailors, after a long voyage. Blood taken from these, appears to be in a dissolving putrescent state. The crassamentum is loose and tender, the serum turbid and reddish; the tongue is black; the teeth furred with a dark, thick sordes; the breath offensive; the urine high-coloured or blackish. Black spots, or a dysentery, frequently appear on the fifth, sixth, or seventh day. The pulse and strength sink after bleeding: sometimes a vast anxiety, fainting, a cold sweat, a thready intermitting pulse soon after. This has sometimes happened in in pleuro-peripneumonies, where the pain of the side was violent, the load at the breast great, and the cough considerable.

This will never bear a second bleeding to advantage; seldom the first, unless there is a considerable degree of firmness and tension in the pulse. When there is reason to be diffident, order scarifications and cupping.

In this disease give a decoction of figs, colt's-foot, and red poppies, well acidulated first with juice of Seville oranges or lemons, and afterwards with *gas sulphuris;* or *elixir vitriol.* nitre, olibanum, myrrh, flowers of sulphur and bole may be administred, with *conserv. lujulæ*, rob of elder, currants, mucilage of quince-seeds, and *syrup. de rubeo idæo:* camphorated vinegar, with syrup of elder or rasberries, is an excellent medicine. A spoonful or two of these latter should be given ever and anon. Sound cyder, and wine and water with Seville orange or lemon juice, drank warm, promote expectoration when deficient. Tincture of roses with red poppy flowers, has moderated an inordinate defluxion of thin bloody ichor. However, oxymel of squills, and strong cinnamon-water, are frequently necessary to pump up the ichor, when a great rattling in the throat and difficulty of breathing indicate a vast quantity of it in the lungs. And yet the violence of the cough may be often appeased by elixir asthmaticum or diacodium. The patient is to be supported with sago, panada, hartshorn jelly, roasted apples, cream of barley, or thick gruel, with a little wine and juice of lemons, giving a little at a time, and often. Strawberries, rasberries, currants, cherries, may sometimes be indulged.

At the close, the whole depends on a well-regulated diet. A tost with diluted red port wine, mulled with Seville orange-peel, mace, or cinnamon, and well acidulated, may be very useful. Blisters are seldom beneficial in this case, but often mischievous.

A very thin yellow spitting, either shews that nothing but the thinnest part of the blood is strained through the arteries of the lungs, or that the whole mass of blood begins to disolve; that its bilious principles are highly exalted, and that all tends to a general putrefaction. It is commonly

monly attended with a violent cough, and expectoration is performed with exceeding great difficulty. Many times it is succeeded by an hæmoptœ from the rupture of the vessels; particularly when the tongue appears very red, smooth, dry, and shining, with a kind of livid bladders at the top.

The concocted matter of inflammatory obstructions of the lungs is partly spit off, and partly carried off by thick turbid urine in large quantities, depositing much reddish or yellow-coloured sediment; and sometimes partly by bilious stools. Nothing promotes this urine, and these stools, more effectually than laxative clysters. Sometimes the morbid matter is critically translated to the legs, to the great relief of the breast; and therefore, in severe pulmonic disorders, a derivation of the humours to the legs may be attempted by tepid bathing and blisters. The discharge from the ulcerated blisters must not be suddenly suppressed; for then the difficulty of breathing and cough will return, or a very great purging or profuse sweats will succeed.

If the patient is not relieved in eight days, the inflammation will end in a suppuration, and an abscess of the lungs, and sometimes in some other part of the body; the symptoms of which are an obstinate dry cough, which motion and taking of food will increase. The easiest posture in lying will be on the affected side; there will be a slow fever, with chilness and shivering at uncertain periods; exacerbations after motion or a repast; thirst, night sweats, a frothy urine, paleness, leanness, weakness. In this case, bleeding must be forborne; the diet must be mild, soft, incrassating, and more plentiful. Tepid vapours should be taken into the lungs, of decoctions of proper ingredients.

When by the symptoms and time the imposthume may be judged to be ripe, the vapour of vinegar itself, and any thing which creates a cough, as oxymel, exercise, and concussion, are proper. The sooner it is broke, the less danger to the lungs.

In this state, which is not absolutely desperate, the aliment ought to be milk, and the drink milk and barley-water, with gentle anodynes, that the patient may have some rest. If the inflammation ends in a gangrene, the case is desperate; if in a schirrus, incurable.

Of the Bastard Peripneumony.

At the beginning of the fever the patient is hot and cold by turns, is giddy upon the least motion, and complains of a rending pain of the head whenever he coughs; he vomits up every thing that he drinks; the urine is turbid, and intensely red; the cheeks and eyes look red and inflamed; his breathing is thick and short; the whole thorax is full of pain, and the straitness of his lungs, as often as he coughs, is perceived by the by-standers: whence the free course of the blood is prevented, which creates a stoppage of the circulation, and takes away all the symptoms of a fever, especially in those of a full habit of body; this may also happen from the blood's being overloaded with a great quantity of pituitous matter, which oppresses it so as to prevent a febrile ebullition.

This disease sometimes steals upon the patient unawares, with a slight weariness, a weakness, a general prostration of the faculties of the mind, thick and short breathing, beginning with an oppression of the breast. The commotions it excites are so small, that the heat and fever are scarce sufficient to make the patient sensible of his danger. Afterward, slight shiverings which come on by fits, and the attacks of a gentle fever, appear; whence the difficulty of breathing and weakness suddenly increasing, bring on death.

When perpetual, laborious wheezing, great anxiety and constant oppression on the præcordia, comatous symptoms, cold extremities, and dark bad-coloured nails and visage come on, the patient is in immediate danger.

When comatous symptoms and a very difficult breathing remain after bleeding, cup and scarify the neck and shoulders. This has frequently had a surprising effect. When the case is very threatening, blister the scarifications.

After bleeding, let the patient have the following clyster, which must be repeated daily till the lungs are relieved.

Take 3 ounces of honey, the yolk of an egg, and 8 ounces of barley-water. Make them into a clyster.

Let the patient's diet be very slender, such as weak broths, sharpened a little with orange or lemon juice, and he may drink a weak mixture of honey and water; the steams of warm water may be taken in at the mouth.

Likewise let the legs and feet be bathed, and large blisters applied. Sydenham advises a repetition of the bleeding and purging alternately, every other day, or at greater intervals, as the strength and symptoms require. But he has generally found twice bleeding sufficient.

Of the Inflammation *of the* Liver.

When the liver is inflamed, it compresses the stomach, diaphragm, and the neighbouring viscera of the abdomen; it stops the circulation of the fluids, hinders the generation and excretion of the gall, and all digestion. It produces a great many bad symptoms, as the jundice, with all the diseases depending thereon; for the liver receives the refluent blood from almost all the parts of the abdomen, and is the chief instrument of almost all the digestions that are made there.

A fever, an inflammation, and pungent pain on the region of the liver and diaphragm, a tension of the hypochondria, yellowness of the skin and eyes, and a saffron-coloured urine, are signs of an inflammatory disposition of the liver.

It begins with cold and shivering, sometimes with vomitting and a fever, watching, difficult breathing, inquietude, and costiveness. This is a kind of rheumatic or erysipelatous fever, proceeding from a sharp viscid serum, lancinating the nervous fibrillæ. It is sometimes accompanied with a bastard pleurisy, to which it is akin.

It is not very dangerous, and rarely kills, unless the viscera are unsound.

Narcotics and sudorifics are to be shunned.

This disease terminates as other inflammations, being cured by resolution, concoction, and excretion of the morbid matter; or else in an abscess, schirrus, or gangrene.

During the first state, a warm regimen and saffron are improper.

Cooling resolving liquors, taken inwardly, as whey with

with ſorrel boiled in it. Outward fomentations, and frequent injections of clyſters, bathing, and frictions, relax, and render the matter fluid. Honey, with a little Rheniſh wine, or vinegar; the juices and jellies of ſome ripe garden fruits; and thoſe of ſome lacteſcent plants, as endive, dandelion, and lettuce, are reſolvent.

Fat oily epithems, and plaiſters, are to be ſhunned. Camphor in croceated ſpirit of wine is only to be uſed in the beginning, or when the fever is moderate, and nature ſluggiſh. Bleeding at firſt is neceſſary on the affected ſide, in the hand or foot.

Violent purging hurts; gently relaxing the belly relieves: diluents, with nitrous ſalts, are beneficial, or tamarinds boiled in warm water or whey.

A clyſter purely oleous is beneficial, with a bladder-full of an emollient decoction. Inwardly, diluting and reſolvent mixtures.

If it is attended with the jundice, then apply epithems of *carduus benedictus*, ſcordium, wormwood, elder-flowers, chamomile, ſeeds of lovage and cummin boiled in wine, and often applied.

Pringle ſays, the beſt remedy, after plentiful bleeding, is to lay a large bliſter over the part affected.

Bloody ſtools, not in an extreme degree, or ſtreaked with blood, ought not to be ſtopped, becauſe they help to reſolve the diſtemper: bleeding at the noſe often does the ſame.

The feveriſh matter is frequently carried off by urine; and therefore diuretics not highly ſtimulating are proper.

Sweating ought not to be promoted by hot cordials, but encouraged by warm diluting liquors.

The caſe is deplorable, when the inflammation terminates in a ſuppuration, unleſs the abſceſs points outwardly, ſo as it may be opened. For if the pus is evacuated into the abdomen, it produces putrefaction, or an incurable hepatic dyſentery or bloody-flux.

Of a Paraphrenitis.

This diſeaſe is an inflammation of the diaphragm, and parts adjacent. A paraphrenitis is attended with a very acute continual fever, an intolerable inflammatory pain of the part affected; which is extremely augmented by inſpiration, coughing, ſneezing, repletion of the ſtomach, a nauſea, vomiting, compreſſion of the abdomen in going to ſtool or making water. Hence, the breathing is thick, ſhort and ſuffocating, and performed only by the motion of the thorax. There is alſo a conſtant delirium; a drawing of the hypochondria inwards and upwards, an involuntary laughter, convulſions, and madneſs.

This diſeaſe terminates as in a pleuriſy; but is attended with more violent ſymptoms, and is much more fatal. If the part affected ſuppurates, the matter will fall into the abdomen, and produce a purulent aſcites.

The cure muſt likewiſe be attempted in the ſame manner as in a pleuriſy.

Of the Inflammation *of the* Intestines.

This diſeaſe contracts the inteſtines, and ſtops up the paſſage through them. There is a vehement, fixed, burning pain, which is irritated by things taken inwardly. When the inflammation is in the upper part of the inteſtines, the ſtomach will be greatly diſtended by wind. When the pain is exaſperated, it produces convulſions of the diaphragm and abdominal muſcles, vomiting, painful inflations, with rumblings, and ſharp griping pains which may bring on the iliac paſſion, or twiſting of the guts.

When there is a burning pain in the abdomen, with a preternatural heat of the whole body, as alſo a quick pulſe, loſs of ſtrength, anxiety, and inquietude, the ſeat of the diſeaſe may juſtly be ſuſpected to be in the inteſtines. If the ſharp pain is above the navel and below the ſtomach, attended with a fever, nauſea, and reaching, it is a ſign that that part of the colon is affected which lies beneath the ſtomach, and is extended from the right to the left-ſide. If the pain lies in the right hypochondrium, under the ſpurious ribs, it ſhews that part of the colon to be inflammed where it joins to the ilium. When the complaint is of the left ſide, under the loins, where the pſoas muſcle is placed, it is a ſign the colon and that part of the meſentery joined thereto is the ſeat of the diſeaſe, eſpecially when it adheres to the peritonæum. But when the pain is in the middle of the abdomen about the navel, it ſhews the ſmall-guts are certainly affected. In all theſe caſes the pain is ſuppoſed to be attended with a fever.

When there is a fever, and a burning pain in the lower part of the belly, attended with a ſwelling, which ends in a copious, putrid, or purulent flux, with a great diſorder of the bowels, it ſhews the ſeat of the diſeaſe to be in the meſentery.

This diſeaſe ſhould carefully be diſtinguiſhed from a cholic proceeding from a cold cauſe, becauſe what is good for the latter is poiſon in the former. It muſt have a ſpeedy remedy, or it will ſoon end in the iliac paſſion or a mortification.

Beſides copious bleeding, there is hardly any other method of cure than fomenting and relaxing the bowels with emollient liquids, taken warm both by the mouth and in clyſters, and this every hour. Yet acids in very deſperate caſes have been known to give relief; ſuch as the juice of lemons taken by the mouth, and vinegar and warm water given in clyſters. When the vomiting is exceſſive and continual, opiates ſhould be given to quiet the convulſions.

Pringle affirms in this caſe, that the beſt method of cure is to lay bliſters over the part affected; and it has been practiſed with ſucceſs. In particular they are uſeful in the ileus, and ſeem to anſwer equally well in the fixed pains of the bowels, whether from an inflammatory or a flatulent cauſe.

Warm fomentations, or young, vigorous, and ſound animals, applied to the body, are extremely beneficial. Arbuth. The patient ſhould only be nouriſhed with broths, in which gently detergent roots have been boiled. Boerh.

It is a fatal error of ſome practitioners, when they find the body obſtinately coſtive, to give one purge after another; which not only exaſperates the diſeaſe, but renders it mortal. Even the clyſters ſhould not be made of very ſtimulating ingredients; but of milk alone, with a little nitre; or rain-water, with ſyrup of violets; or of marſhmallows, or roſes ſolutive.

After

After bleeding and clyfters, if the pain ftill continues violent, there will be no manner of danger in giving opiates, by which means the excruciating pain will be alleviated, the fpafms appeafed, and a breathing fweat will follow. When this is done, and the fever is abated, there will be no occafion to continue the diluting, relaxing, and moiftening medicines, but rather the nervous and corroborating.

If the patient furvives three days, and the acutenefs of the pain abates, with a chilnefs or fhivering throughout the body, it is a fign of a fuppuration: then within fourteen days the impofthume will break; and if it falls into the cavity of the abdomen, it will corrupt the whole mafs of fluids, putrefy the vifcera, and turn to an afcites; whence the patient will die of a confumption.

In this cafe, whey and chalybeate waters are likely to prove moft beneficial.

If the fever continues, with clammy fweats, palenefs, an ichorous diarrhœa, fetid, black, or like the wafhings of flefh, a fmall intermitting pulfe, and at laft a total ceffation of pain; they are figns of a gangrene and an approaching death.

Of the Nephritis, *or* Inflammation *of the* Kidneys.

The fymptoms of a nephritis are, a great inflammatory, pungent, burning pain, in the place where the kidneys are fituated, attended with a fever; the urine is made often, but fmall in quantity, and very red or flame-coloured, yet, in the higheft degree of the difeafe, watry. There is a numbnefs of the thigh, and a pain in the groin and the tefticle, of the fame fide; a pain in the ilium, bilious vomiting, and continual eructations.

When the inflammation is deep, the fever violent, the burning pain in the loins lafting, the difficulty of making water great, the body very coftive, the anxiety and ftraitnefs of the præcordia exquifite, the urine crude and white; likewife if the pain continues till the fourteenth day, the kidney will fuppurate; which is known from the abating of the pain, and from the thick purulent fediment of the urine. This will fometimes laft feveral years, till there is nothing left of the kidney but a bag: It is attended with a hectic fever, and the patient before he dies is almoft reduced to a fkeleton. If the bag happens to burft, it brings on a retention of urine, and intolerable pains, which end in death.

If it continues beyond the feventh day, an abfcefs is to be feared, which is known to be forming by a remiffion of the pain, fucceeded by a pulfation in the part, and chilnefs and fhivering often returning.

When the difeafe is favourable, it is cured by refolution, of a copious, red, and thick urine difcharged at one time, or by a large flux of blood from the hæmorrhoidal veins, in the beginning of the difeafe.

It is cured by plentiful bleeding, revulfion and dilution; by foft, emollient, antiphlogiftic decoctions.

When a burning and fixed pain in the loins continues for fome time, it is a fign that the venal veffels are ftuffed and obftructed with a thick blood, which requires immediate bleeding in the foot; or if there is a difpofition to a hæmorrhoidal flux, apply leeches to the anus. Afterwards give fuch things as temperate the heat of the blood, and promote a free circulation, with a diaphorefis. For which purpofe, emulfions, demulcents, diluents, antifpafmodics, diaphoretic powders, with cinnabar and nitre, are preferable to every thing elfe.

Emollient clyfters, without any faline or purging ftimulus, are the principal help in this difeafe. They may be made of milk, whey, or foft water, in which elder and chamomile flowers have been boiled; to which add an ounce or two of fyrup of marfhmallows, and a dram of nitre.

When there are convulfions, or exceffive pain, opiates are proper. If the vomiting, a fymptom of this difeafe, is too frequent, warm water fweetened with honey is beneficial.

The patient fhould avoid all acrimonious aliment; he fhould neither lie too hot, nor on his back.

When an abfcefs is formed, the medicines muft be powerfully maturating and emollient: When the urine appears purulent, they muft be diuretics of medicated waters, whey, and the like; together with balfamics.

Emulfions are likewife ufeful of the four cold feeds and fweet almonds. Some attribute a great virtue to cherry-tree gum diffolved in whey or water, and taken often. Alfo fyrup of marfhmallows is very ufeful. Add to thefe, the decoction of veronica, fweetened with honey, and mixed with powder of nutmegs.

Butter-milk, not very four, has been reckoned a great fecret in ulcers of the kidneys; and chalybeate waters have been beneficial to fome. Spruce-beer is a good balfamic in this cafe.

Of the Inflammation *of the* Bladder.

The pathognomonic fort of this difeafe are, an acute, burning, preffing pain in the region of the pubes, attended with a fever, a continual tenefmus or defire of going to ftool, and a perpetual ftriving to make water.

Other fymptoms are, a rumbling of the bowels, gripping pains, great anxiety of the præcordia, difficult breathing, want of appetite, vomiting, coldnefs of the extreme parts, a hard, quick, unequal, contracted pulfe, inquietude, and fometimes convulfions.

There is another kind which is more fuperficial, and is either rheumatic or eryfipelatous, in which the fever is more eafily and fpeedily cured by promoting a diaphorefis: And perfons in years, or who are affected with the fcurvy, gout, rheumatifm, or violent head-achs, are moft fubject to it; efpecially if they catch cold by being expofed to the rigour of a cold north-wind.

The former arifes moft commonly from the ftoppage of the menfes, bleeding piles, or other ufual fanguinary evacuations; and not feldom from a violent gonorrhœa unfkilfully fuppreffed by aftringents, or when treated by medicines of too fhurp and hot a nature.

This difeafe is mortal, if it terminates in an ulcer or mortification.

The cure muft be attempted with bleeding in the feet, if a fuppreffion of the menfes or hæmorrhoidal flux be the caufe.

If it proceeds from the fcurvy, *&c.* recourfe muft be had to gentle diaphoretics, diluents, and remedies which

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obtund the acrimony of the humours, ſuch as decoctions of the roots of ſcorzonera, china, ſkirrets, and fennel; alſo infuſions, in the manner of tea, of the tops of yarrow, flowers of mallows, winter-cherries, and ſeed of daucus, made with milk, and ſweetened with *ſyrup de althæa* If the patient's body is coſtive, manna will be proper, with *nitrum ſtibiatum;* to which rhubarb may be joined, as occaſion requires.

Externally, antiſpaſmodics and gentle diſcutients will be proper: For this purpoſe apply bladders filled with a decoction of the emollient flowers.

If the teneſmus and difficulty of urine ariſe from ſpaſms, there is nothing better than the vapours of a decoction in milk of the flowers of melilot, elder, chamomile and mallows, and the tops of yarrow. This decoction may be put into a cloſe-ſtool; and the patient ſit over it.

Tulpius informs us, that a deſperate ulcer of the bladder was cured by the conſtant uſe of ſpaw water.

Of the Opthalmia, *or* Inflammation *of the* Eyes.

An inflammation of the membranes which inveſt the eye is a very common diſeaſe, eſpecially of the adnata or albuginous coat of the eye.

The eyes are very much inflamed, with great pain, tenſion, tumour, heat, and redneſs; and ſometimes there is ſuch a ſtrong ſenſation of pricking in the eye, as if it was cauſed by a needle or thorn. The eyes at firſt are full of ſcalding tears; which are followed by a pituitous matter, which is ſometimes ſmall in quantity, ſometimes more plentiful: a ſordes adheres to the greater angle of the eye; and when the diſeaſe is violent, the neighbouring parts will ſwell even as far as the cheeks, with a ſtrong pulſation of the adjacent arteries. The ſmall blood-veſſels are viſible, which in health are not to be ſeen, and all the white of the eye becomes red.

If, beſides theſe external ſigns, there is an appearance of moths, duſt, flies, *&c.* floating in the air, there is an inflammation of the retina.

As in all diſeaſes of the eyes, ſo eſpecially in their inflammation, the patient muſt abſtain from all ſpirituous liquors, the ſmoak of tobacco and ſternutatories; he muſt likewiſe avoid ſmoaky rooms, and the vapours of onions and garlick, as alſo all vivid lights and glaring colours. The drink may be water alone, or a decoction of fennel-ſeeds, hartſhorn, and barley; the aliment muſt be light of digeſtion.

Intemperance of all kinds renders perſons liable to this diſeaſe; as alſo a keen north-wind, and looking earneſtly at the fire, ſun, or glaring colours: likewiſe ſmoaky rooms, metallic vapours, coſtiveneſs, and unuſual refrigerations of the extreme parts, eſpecially in the time of menſtruation. Sometimes it is owing to other diſeaſes, as the ſmall-pox, meaſles, ſcurvy, and the driving back the gouty matter.

A ſlight ophthalmia is eaſily cured; a more ſevere one generally continues a month or longer, and often leaves a ſpot in the cornea, or depraves the humours of the eye.

The ſlighter inflammations from duſt or the ſun are removed by fomenting with warm milk and water, and anointing the eyes with tutty ointment at night: if the eyes are weak and but little inflamed, they may be waſhed with brandy and water.

In all caſes we are to look narrowly and often into the inflamed eye; ſince the inflammation may be either begun or be kept up by moats, or by hairs of the cilia falling in, or growing inwards, ſo as to cauſe conſtant irritation.

Take away 10 ounces of blood, and the next morning give the common purging potion, which may be repeated twice or more, with the interpoſition of two days between each doſe, and at night an ounce of diacodium.

On the days in which purging is omitted, let the patient take four ounces, three or four times in a day, of the emulſion of the four greater cold ſeeds, and white poppy ſeeds.

If the diſeaſe will not yield to repeated cathartics and bleeding, give an ounce of diacodium every night.

The ſlighter caſes may be cured without bleeding; but if any degree of a fever is joined, or the inflammation is conſiderable, this evacuation is never to be omitted. The more violent inflammations are not to be cured without larger bleedings, unleſs we can make a derivation from the part affected without draining the whole body. For this purpoſe bliſters are uſefully applied behind the ears, eſpecially if they are to lie on for two or three days, and if the ſores are afterwards kept running. Two leeches ſhould be applied to the lower part of the orbit, or near the external angle of the eye, and the wounds be allowed to ooze for ſome hours after they are fallen off.

This method will likewiſe do in ophthalmias from external injuries; but not when they proceed from a ſcrophulous or venereal cauſe. In bad caſes, after the inflammation has yielded a little to evacuations, the coagulum aluminoſum, ſpread on lint, and applied at bed-time, is the beſt external remedy.

In the mean while, bliſters muſt be applied to the neck, and kept running for ſome days; and after that, ſetons, or iſſues at leaſt. It is hard to ſay, of what vaſt advantage bliſters and ſetons are in this diſeaſe.

The expreſſed juice of millepedes may alſo be given [25 are a doſe] on the days purging is omitted, in four ounces of beer, or Rheniſh or French white-wine: let them ſtand, when mixt, all night; and then take it with a little ſugar in the morning, after the mixture is drained.

But according to the later experience of Dr Fordyce, Fothergill, and others, a ſtrumous opthalmia may be certainly and ſafely cured by half a dram of the bark given twice a-day.

The length of time in which the bark is to be taken is uncertain, for in ſome the cure is performed in leſs time than others.

Hoffman, beſides bliſters, ſetons, *&c.* recommends cupping, with ſcarification, in the nape of the neck, and behind the ears; and in the violent ſort of this diſeaſe, bleeding in the jugular; as alſo ſinapiſms of rocket-ſeeds boiled in wine, and then put into ſmall bags and applied to the nape of the neck or under the armpits. For inward uſe, he prefers to all other remedies, an infuſion, in the manner of tea, of valerian-root, liquorice, elder-flowers and fennel-ſeeds, drank plentifully; and before the

the drinking of it to receive the vapour or ſteam into the eyes.

Of the Apoplexy.

This diſeaſe is a ſudden abolition of all the ſenſes, external and internal, and off all voluntary motion, commonly attended with a ſtrong pulſe, laborious breathing, a deep ſleep, and ſnorting.

There is no difference between a perſon aſleep and in an apoplexy, but that the one can be awaked, and the other cannot.

The cauſes of this diſeaſe are a particular conformation of the body, as a ſhort neck, for ſome have fewer vertebræ in their necks than others; a groſs, plethoric, fat, phlegmatic conſtitution; polypous concretions in the carotid and vertebral arteries, or about the heart, or within the ſkull, which are known by an unequal pulſe, a vertigo, and ſometimes a momentary loſs of ſight; an inflammatory thickneſs of the blood, preceded by a fever attended by the head ach, redneſs of the face and eyes, an advanced age, attended with a glutinous, cold, catarrhous, leucophlegmatic conſtitution.

The forerunners of an apoplexy in theſe laſt, are, dulneſs, inactivity, drowſineſs, ſleepineſs, ſlowneſs of ſpeech and in giving anſwers, vertigoes, tremblings, oppreſſions in ſleep, night mares; weak, watery, and turgid eyes; pituitous vomiting, and laborious breathing on the leaſt motion.

Other cauſes may be, whatever compreſſes the veſſels of the brain; as, a plethora, a cacochymy, attended with fulneſs of the veſſels; a hot conſtitution; tumors within the ſkull; the velocity of the blood increaſed towards the head, and diminiſhed downwards; compreſſion of the veins without the ſkull, which bring the blood back from the brain; the effuſion of any fluid compreſſing the dura and pia mater externally; the effuſion of any fluid within the brain, which by its preſſure hurts the origin of the nerves; this is the moſt common cauſe of apoplexies, and proceeds from blood in the plethorical, from a ſharp ſerum in the hydropical and leucophlegmatical, and from an atrabilious acrimony in the melancholic, the ſcorbutic, and the podagric. Violent paſſions of the mind, and intenſe ſtudy, are prejudicial to theſe.

There are three degrees of an apoplexy. The firſt is, when the vital fluids are, by the force of violent diſtentions, driven from the lower and outward parts of the body, to the external parts of the head, and to the brain and its meninges, by the carotid arteries; whereby their veſſels are expanded, and the free circulation through them impeded. While this ſtagnation of the blood continues, the external and internal ſenſes are aboliſhed; and as the ſtoppage goes off they are gradually reſtored. Such are the fits that hypochondriacal and hyſterical perſons are ſubject to.

The ſecond degree is, when the ſtagnation continues ſo long that the ſerum oozes through the veſſels, and falls upon the ſides of the medulla oblongata or ſpinalis, and ſo ſtops the influx of the nervous fluid, and produces a hemiplexia or a palſy.

The higheſt degree is, when the fine veſſels of the pia mater are broke, and the extravaſated blood occupies the baſis of the brain.

The firſt may be cured by timely bleeding: the ſecond, though it does not ſuddenly kill, yet it generally renders the patient infirm ever after: the third is almoſt always mortal.

The immediate forerunners of an apoplexy, are trembling, ſtaggering, a giddineſs in the head, a vertigo, dimneſs of ſight, a ſtupor, ſleepineſs, forgetfulneſs, noiſe in the ears, more deep and laborious breathing, the nightmare.

A ſlight apoplexy goes of in a profuſe, equal, roſcid, warm ſweat; a large quantity of thick urine, by the bleeding piles, the flowing of the menſes, a diarrhœa, or a fever. If it is more ſevere, it uſually terminates in a paralytic diſorder; and is ſeldom curable, but always leaves behind it a great defect of memory, judgment, and motion.

Bleed in the arm to 12 ounces, and then in the jugular to 7 ounces; immediately after which, give an ounce and a half, or two ounces, of emetic wine.

Apply a large ſtrong bliſter to the neck, hold the patient upright in bed, and let the ſpirit of ſal ammoniac, highly rectified, be held to his noſe.

Let there be ſtrong frictions of the head, feet, and hands; and let the patient be carried upright backwards and forewards about the room, by two ſtrong men. Strong bliſters ſhould be applied to the head, neck, back, and calves of the legs. Sharp clyſters ſhould be thrown up into the body, which have a tendency to excite the patient, and to cauſe a revulſion.

Shaw adviſes, during the fit, to bleed largely in the arm, or rather in the jugular, to apply ſtrong volatiles to the noſe, to blow ſneezing powders up the noſe, as alſo to rub the temples with ſpirituous cephalic mixtures.

Likewiſe to blow in the mouth and noſtrils the ſmoke of tobacco from an inverted pipe.

Thoſe who have once had a fit of the apoplexy, are very liable to be ſeized with it again; and if they are plethoric, the beſt preſervative is bleeding once in three months, and uſing themſelves to a ſpare diet; taking medicines which ſtrengthen gently, and abſtaining from cares and all intenſe applications of the mind; not neglecting iſſues and ſetons, nor the drinking ſuitable mineral waters.

Of the Palsy.

A Palsy is a lax immobility of any muſcle, not to be overcome by the will of the patient. Sometimes the ſenſation of the part is abſolutely aboliſhed, and ſometimes there remains a dull ſenſe of feeling, with a kind of tingling therein.

It may be cauſed by all things that bring on an apoplexy; that render the nerves unfit to tranſmit the animal ſpirits; that hinder the entrance of the arterial blood into the muſcle. Hence the nature of a paraplegia or hemiplegia, and the palſy of a particular part, may be underſtood.

Hence a palſy may proceed from an apoplexy, an epilepſy, extreme and laſting pains, ſuppreſſions of the uſual evacuations,

evacuations, tranſlations of the morbific matter in acute diſtempers; whatever diſtends, diſtorts, compreſſes or contracts the nerves, ſtrong ligatures, luxations, fractures, wounds, gangrenes, inflammatory and other tumors of the coats of the nerves, in the ganglia, or the nerves themſelves; extreme heat, violent cold, mineral effluvia, and the too frequent uſe of hot water.

Palſies of the heart, lungs, and muſcles ſerving for reſpiration, are ſoon fatal; of the ſtomach, bowels and bladder, from internal cauſes, very dangerous; of the face is bad, and eaſily changes to an apoplexy.

If the part is cold, inſenſible, and waſtes away, it ſeldom admits a cure; if attended with a violent convulſion and great heat of the oppoſite part, it is very bad.

The regimen in this diſeaſe ought to be warm and attenuating, conſiſting of ſpicy and cephalic vegetables, ſuch as create a feveriſh heat, becauſe it is neceſſary to diſpel the viſcoſity. Soapy vegetables are beſt, and ſuch as conſiſt of an acrid volatile ſalt, and oil, muſtard, horſe radiſh, *&c.* ſtimulating by vomits; ſneezing; relaxing the belly; promoting ſweat by ſuch motions as can be uſed, or other means; by ſtrong friction, *&c.*

The cure of the palſy is to be attempted by attenuants and diſcutients; ſuch as, aromatic, cephalic, nervous and uterine vegetables; their fixed and volatile ſalts; as alſo by their oils; ſoaps made of their oils and ſalts; the ſtrong ſcented parts of animals; the juices, ſpirits, oils, and tinctures of inſects; foſſile ſalts, metallic cryſtals, and medicines compounded of theſe.

Likewiſe by things which ſtimulate ſtrongly, and which, by exciting a tremulous and convulſive motion of the nerves, drive out the impacted matter; to this claſs, ſternutatories and emetics chiefly belong, eſpecially if often uſed at firſt.

By purging with warm, opening, aromatic vegetables, with acrid foſſils, with mercurial and antimonial preparations, in a large doſe, and repeated ſucceſſively for ſeveral days, by the means of which a copious and laſting diarrhœa may be excited.

By filling the veſſels of the body with drinking a large quantity of the attenuants above mentioned, and then by exciting a greater motion and ſweat by the vapours of ſpirits ſet on fire.

Outwardly, frictions may be uſed, either dry and hot, till the part is red; or with ſpirits endued with a ſtimulating virtue; or with nervous oils, liniments, balſams, or ointments; vapour or immerſive baths; acrid, aromatic, and drawing plaiſters; cupping, ſcarifications, bliſters; whipping the part with rods; exciting a ſlight inflammation with nettles, and the like.

A courſe of electrification for ſome weeks has been known to have cured ſome inveterate palſies, though it hath failed in others. See ELECTRICITY.

Of the EPILEPSY, *or* FALLING SICKNESS.

SOMETIMES this diſeaſe comes on ſuddenly and unawares; but it oftner gives notice of its acceſſion by ſome preceding ſymptoms; the chief of which are, a laſſitude of the whole body, a heavy pain of the head with ſome diſturbance of the ſenſes, unquiet ſleep, unuſual dread, dimneſs of ſight, a noiſe in the ears: in ſome there is a violent palpitation of the heart, a puffing or inflammation of the præcordia, a ſtopping of reſpiration, a murmuring noiſe in the belly, fœtid ſtools, a flux of urine, a refrigeration of the joints: in others, there is a ſenſe, as it were, of a cold air aſcending from the extreme parts to the heart and brain.

Then they fall ſuddenly on the ground, (whence the name of the falling ſickneſs;) the thumbs are ſhut up cloſe in the palms of the hands, and are with difficulty taken out; the eyes are diſtorted or inverted, ſo as nothing but the whites appear; all ſenſation is ſuſpended, inſomuch that by no ſmell, no noiſe, nor even by pinching the body, can they be brought to themſelves; they froth at the mouth with a hiſſing kind of a noiſe, the tongue is lacerated by the teeth, and there is a ſhaking or trembling of the joints.

However, the convulſions vary, as well as the defect of the ſenſes, both in degree and kind; for ſometimes, inſtead of convulſive motions, the limbs are all ſtiff, and the patient is as immoveable as a ſtatue. In infants the penis is erected; in young men there is an emiſſion of ſemen, and the urine very often ſtreams out to a great diſtance.

At length there is a remiſſion of the ſymptoms, and the patients come to themſelves after a longer or ſhorter interval; then they complain of a pain, torpor and heavineſs of the head, and a laſſitude of all their joints.

Theſe fits are more frequent or ſeldom, or longer or ſhorter, according to their different cauſes. Some return on certain days or hours, or even months, according to the quadratures of the moon, but eſpecially about the new or full moon; in women, chiefly about the time of menſtruation; and what is moſt remarkable, often upon a very ſlight occaſion; for inſtance, any ſudden perturbation of the mind, as a fright, anger, ſudden joy, intenſe application, ſtrong liquors, exceſſive heat or cold, or venereal exerciſes.

As to the prognoſtics; in boys, this diſeaſe terminates about the ſeventh, the fourteenth, or the ſeventeenth year, that is, about the time of puberty; in women, about the fourteenth, *viz.* the time of menſtruation. Likewiſe it has been found by experience, that chronical epilepſies have ſpontaneouſly ceaſed by the change of place, diet, and way of life. Sometimes a quartan ague will put an end to an epilepſy and convulſion-fits. It is alſo remarkable, that the itch, or any other cutaneous diſtemper, ſuch as the ſmall pox, meaſles, miliary eruptions, *&c.* will either abate the violence, or quite ſtifle this diſeaſe.

The patient therefore need not deſpair of a cure, if the diſeaſe is not of long ſtanding, the fits ſhort, the diſorder not hereditary, and the years advancing to the time of puberty; or if it proceeds from a fault in the *primæ viæ*, from worms, from a bad regimen, or from a ſubcutaneous diſeaſe ill cured. Nor is the caſe deſperate if the epilepſy be ſlight, and when the fit is foreſeen by a ſenſation of cold air, ariſing from the extreme parts to the back, præcordia, and head, and alſo when it is uſhered in by anxiety, by want of ſtrength, and a propenſity to vomit; or when the ſenſes are not quite aboliſhed in the time of the fit, or when it comes on in the night, without the incurvation of the thumbs.

It

It is a bad ſign if the epilepſy makes its firſt attack after the twenty firſt year, but much worſe if the fits grow more frequent; for then the animal functions are often deſtroyed, and not only the memory, wit, and judgment are impaired, but the patient grows ſtupid and fooliſh. It ſometimes ends in melancholy or madneſs. When it turns to a palſy or apoplexy, it is mortal.

The epilepſy is extremely difficult to be cured in adults, but in children it is the reverſe. Bliſters laid to the back part of the head are of great uſe a little before the paroxyſm is expected: and the time may more certainly be foreknown, as this diſeaſe is influenced by the moon, and attends upon its phaſes, eſpecially the new or full moon. The moſt proper medicines to correct the juices ſeem to be native cinnabar, and wild valerian root; a dram of which may be given morning and evening for three or four months, and afterwards two or three days before the new and full.

However, it muſt not be forgot, that this diſeaſe owes its origin to ſo many different cauſes, and is bred in ſo many different conſtitutions of the body, and the ſame remedy which ſucceeds in one caſe often fails in another; and therefore different medicines are to be tried, eſpecially on adults. And great regard muſt be had to the times in which the paroxyſms uſually return, in order to effect a cure.

If the veſſels are full of blood, or it is carried with too great an impetuoſity towards the head, then bleeding in the ankles will be proper, or leeches applied to the hæmorrhoidal veins. This often happens to hypochondriacal or hyſterical perſons, to the melancholic, and women with child. Sometimes it will be proper to bleed in the jugulars; or to apply cupping-glaſſes with ſcarifications to the neck, and parts near the head.

It has its origin from a ſharp, impure ſerum in the head, or in the membranes and veſſels, as in cachectical or ſcorbutical perſons, or thoſe who have been inconſiderately cured of œdematous ſwellings of the feet, old ulcers, or iſſues dried up; the driving in of the itch, ſcabs, or the ulcerating humour of a ſcald head; then the cure may be attempted by cathartics, by purifiers of the blood, by evacuating the impure humours with ſetons, iſſues, cauteries, and bliſters.

If it proceeds from violent pain, as for inſtance, from a ſtone ſticking in the ureter, from the tooth-ach, ear-ach, or ſpaſms of the ſtomach and bowels; then clyſters of oil of ſweet almonds, or the like, are to be adminiſtered.

If, in children, it proceeds from gripes, or the breeding of teeth, nothing is better than to cleanſe the *primæ viæ* from filth, by milk-clyſters, with a little venice-ſoap diſſolved in them.

If from worms, after antiſeptics and ſoft oily things, anthelmintics muſt be given, ſuch as tanſey, garlick, camphor, aſa fetida, worm-ſeed, mercurius dulcis, and ethiops mineral, or powder of tin.

When the fits return at certain periods, or at the quadratures of the moon, a clyſter or a vomit will be proper firſt of all, of half a dram of ipecuanha, in a decoction of raiſins.

In the time of the fits, too free a uſe of volatiles, ſpiritous liquors, and ſtrong ſmells, are hurtful, as cauſing the humours to flow too much to the head: The beſt method is to place the patient in an erect poſture, and to rub the hands and feet pretty briſkly.

The beſt drink is water, which will mitigate, if not cure the ſymptoms.

When the patient is ſo happy as to foreſee the acceſſion of the fit, then let him have immediate recourſe to clyſters and frictions of the lower parts.

A milk-diet alone has cured an inveterate epilepſy. Miſleto is ſaid to cure an epilepſy as ſure as the bark an intermitting fever. The doſe to grown perſons is half a dram or more, in powder, every ſixth hour, drinking after it a draught of a ſtrong infuſion of the ſame plant. If to every ounce of the powder, a dram of aſa-fetida be added, the medicine will be ſtill more effectual.

Cinnabar of antimony is greatly celebrated for the cure of this diſeaſe; and may be taken from four grains to a ſcruple, in conſerve of roſemary flowers.

Ferreus and Jachinus affirm, they have cured many epilepſies with a ſimple decoction of guaiacum, giving ſix or eight ounces of it twice a-day, and the ſecondary decoction of the ſame for their ordinary drink. This decoction ſhould be continued 30 or 40 days, to which may be added male piony root, or ſomething of the ſame kind; and every doſe may have a few drops of the ſpirit of vitriol added thereto.

After all, there is no medicine that can be depended more upon than MUSK; for it is an excellent remedy in all diſeaſes of the nerves, particularly cramps, convulſions, vertigoes, and epilepſies. Ten grains may be taken morning and night, made up into a bolus; if the ſame quantity of factitious cinnabar be added to each doſe, it will not be the worſe.

Of St VITUS'S DANCE, *and other convulſive diſorders.*

ST Vitus's dance is a ſort of a convulſion, which boys and girls are ſometimes ſubject to, from the age of ten years, to the time of puberty. It diſcovers itſelf firſt by a kind of lameneſs, or an inſtability of one of the legs, which they draw after them in a ridiculous manner, nor can they hold the arm of the ſame ſide ſtill for a moment; for if they lay it on their breaſt, or any other part of their body, it is preſently forced away from thence by a convulſive motion. If they are deſirous of drinking, before they can bring the cup to their mouth, they uſe a thouſand odd geſticulations like a mountebank; for they cannot bring their hand in a direct line to their mouth, but it is forced this way and that, till at length, if they have the good fortune to hit the mark, they throw the liquor down their throat as greedily as if they deſigned to raiſe laughter in the ſpectators.

In a convulſive paroxyſm, the limbs are ſtrangely agitated with various different poſtures and motions. Sometimes the hands are put behind them as if they deſigned to ſit upon them, and ſoon after they ſeem to be beating the air; then their legs will be drawn hither and thither as if they were dancing ſome antic dance. Sometimes they will bend their backs like a bow, at the ſame time raiſing their breaſt as high as they can; then their whole body will grow ſtiff, and as immoveable as a ſtone. They generally

generally keep on their legs without falling; yet some will grovel on the earth like epileptic persons, and will weep, laugh, gnash their teeth, gape with their mouths, put out their tongues, roll their eyes, and whirl their heads about in a strange manner.

After the fit, some are inexpressibly weak; some faint away, others fall into a deep sleep; in others, again, the fit is terminated with eructations, wind, vomiting, and throwing out plenty of water. Very often a mucus distils from the nose, or blood issues from thence, or from the uterus or hæmorrhoidal veins.

These persons have generally unquiet sleep, and full of dread and terror, an uncertain appetite, their bodies generally a little costive; they sweat with difficulty, but are subject to great passions of the mind. The accessions of the fits keep exact pace with the phases of the moon. In women they precede or accompany the eruption of the menses. They are most frequent and worst after meals; and are easily excited by the passions of the mind.

The fits are generally preceded with a coldness of the feet and limbs, or a kind of tingling sensation; which also affects the os coccygis, and like cold air ascends up the spinal marrow; there is a distended flatulent pain in the left hypochondrium, and such a constipation of the body that neither wind nor excrements can make their exit, nor will the anus admit a clyster-pipe, or, if it does, the clyster and excrements are thrown up by vomit. The bladder is likewise so affected, that no urine can be made, or at least but little, and thin and white. In others, the accession begins with yawning, stretching, anxiety about the heart; a hard unequal contracted pulse, the heart-burn, nausea, vomiting, palpitations of the heart, difficulty of swallowing, pain of the head and teeth, noise in the ears, giddiness, *&c.* and then come on the convulsions.

Though this is a terrible disease, it never kills suddenly. When it is recent, the person young, and otherwise of a good constitution, there is the greatest hopes of a speedy cure. If usual evacuations of blood by the uterus or hæmorrhoids are suppressed, the return will either mitigate or cure the disease. On the contrary, if the humours are thick and impure, the suppression obstinate, their temperament inclining to great sensibility, the age advanced, or the disease hereditary, or become habitual, the cure is difficult. Sometimes, through ill management, it degenerates into an epilepsy or hypochondriac melancholy.

To cure the St. Vitus's dance, take away about 8 ounces of blood, more or less, according to the age of the patient; the next day give half, or something more of the common purging potion according to the age, and in the evening the following draught:

> Take an ounce and a half of alexeterial water; 30 drops of compound spirit of lavender; a scuple of theriaca andromachi; and 8 drops of the tinctura thebaica. Mix and make them into a draught.

Let the cathartic potion be repeated thrice every other day, and the same draught in the evening. After which, bleed again, and repeat the cathartics three or four times; and this course may be pursued to the third or fourth time.

Apply to the soles of the feet *emplastrum e caranna.* For fear of a relapse, at the same season of the next year, or a little sooner, in which the distemper appeared, bleeding should be again repeated, and purging two or three times.

Allen cured two girls of this distemper with the expression of millipedes and the Peruvian bark, after bleeding and a gentle cathartic.

As to the cure of other convulsive disorders, if the patient is plethoric, or the pulse great, it must be begun with bleeding either in the arm or foot; and if occasion require, it must be repeated two or three times, but not till the fit is over. The air should be dry and serene, with constant exercise; the aliment should be easy of digestion, and all hot spirituous liquors should be avoided. The constant drink should be the decoction of scorzonera roots, with shavings of hartshorn, or whey, or the Selter's mineral waters. *Pediluvia* are likewise proper, of river-water, wheat-bran, and chamomile-flowers. They should be used pretty warm and deep, at the time of going to bed, and afterwards sweating should be promoted.

The patient's body, if costive, must be kept open with manna, or with oily clysters; and if the *fomes* of the disease is judged to be in the *primæ viæ*, it will be proper, at the changes of the moon, to give a vomit with manna, that is, an ounce of manna with two or three grains of tartar emetic.

If, about the time of puberty, this disease proceeds from too early or excessive coition, or violent passions of the mind, all things which cause a commotion in the fluids must be avoided; such as, aromatics, sharp purges, emetics, spirituous liquors, inordinate motions of the body or mind, and all heating things in general. On the contrary, the diet should be soft, emollient, and nourishing; such as cow's or ass's milk, or whey; as also baths of sweet water mixed with milk. Likewise jellies, and decoctions of scorzonera, barley, hartshorn, ivory shavings, and viper's flesh, for ordinary drink, and chocolate.

If it proceeds from worms, the cure depends on their being killed and expelled out of the body: But all anthelmintics, or worm medicines, are not to be made use of in this case; such as garlick, vitriol, copper, aloes, sharp purges, and mercurials; because, if they are given inconsiderately, they are hurtful to the nerves. It will be better to use clysters, made of milk, sweet things, and oil; as also liniments of a purging quality applied to the navel and abdomen. Inwardly may be taken *semen santonici.* If mercurius dulcis is given with a cathartic, it will be necessary first of all to let the patient take a few spoonfuls of oil of sweet almonds.

If it is caused by a suppression of the menses, emmenagogues and hot medicines are to be forborne; but bath-waters and bleeding will be proper; as also *pediluiva*, if made pretty warm; hot infusions of balm-flowers, and flowers of the lime-tree, tincture of castor, absorbent powders, antispasmodics, and anodynes.

If from a stoppage of the hæmorrhoidal flux, besides bleeding and the above remedies, leeches applied to the anus will be of very great advantage.

In the observations of the med cal society of London, we have an account of a deplorable convulsive case being cured by electricity.

Of

Of the Convulsive Asthma.

An aſthma is an impeded and very laborious reſpiration, attended with unſpeakable anxiety, and a ſtraitneſs about the præcordia, hindering the free circulation of the blood through the lungs, ariſing from variety of cauſes, and not without danger of ſuffocation.

There are ſeveral ſorts of aſthmas. One is, difficulty of breathing, proceeding from corpulency and a very full habit of body; and is moſt apparent after violent motion: but this is a ſlight diſorder, and free from all danger. The next is the pituitous aſthma, attended with a moiſt cough, and the bringing up pituitous matter; it attacks the patient at all hours, and in all poſitions of the body, and is owing to a plenty of a viſcid mucus, ſtuffing the veſiculæ of the lungs, and hindering the free ingreſs and egreſs of the air through them. Another is owing to the convulſive contraction of the parts deſigned for reſpiration, and proceeds from various cauſes both within and without the thorax; and this is called the dry flatulent or convulſive aſthma.

There is a heavineſs of the breaſt, a ſlowneſs to perform cuſtomary labours, difficult breathing when going up a hill; the patients grow hoarſe, cough, and are troubled with frequent eructations; they cannot ſleep, and are ſcarcely warm in their beds. As the diſeaſe grows worſe, the cheeks look red, the eyes grow prominent as if they were ſtrangled; they ſnore or wheeze while waking, but much more when aſleep; they are fond of cold air, they keep themſelves in an erect poſture, and ſeem to ſuck in the air with open mouth: they are troubled with ſweating about the neck and forehead; then comes on a violent cough, and the patient brings up a little cold frothy matter. As they draw in their breath, the neck ſwells, and the præcordia are pulled upwards; the pulſe is ſmall and quick. If it increaſes, the patient is in danger of ſuffocation: but if it grows better, the fits are ſeldom, and greater plenty of matter is coughed up; the urine is more plentiful, but without a ſediment; the voice grows clearer, the ſleeps longer than are neceſſary, the præcordia are ſet at liberty; a pain ſometimes paſſes to the ſhoulders; the breathing is ſlow and gentle, but with a ſort of a wheezing.

The longer this diſeaſe continues, the more ſharp and violent all the ſymptoms become. The patient's body grows more coſtive, and the urine is thin and watry; moſt commonly the feet ſwell, then the hands, face and back; there is a numbneſs of the arms, the countenance is wan and livid, or of a leaden colour. Then comes on a little fever, which grows worſe in the evening; the whole body is cachectic, with an œdematous ſwelling of the feet; there is a dropſy of the breaſt, or an aſcites, or anaſarca; at leaſt there is a palſy on one ſide, or of the arm; or, inſtead, thereof a palſy of the eyelids.

When the diſeaſe is recent, and is owing only to the ſpaſmodic contraction of the præcordia, there are hopes of a cure; eſpecially if the matter of the gout, ulcers, and exanthemata, are ſent back to their proper ſeats. When the menſes or hæmorrhoids which were ſtopped return, it yields relief, and, if the diſeaſe was not too far advanced, perfect health. If it is inveterate, or ill managed, it brings on a dropſy of the breaſt, obſtructions of the lower belly, œdematous ſwellings of the feet, a cachexy, and an univerſal dropſy. In general, all convulſive aſthmas portend a ſudden exit, or ſuffocation, eſpecially if there is a polypus of the heart: if it continues long, then the patient will die of the dropſy; in which caſe it will be ſoon fatal; when there is a ſlow fever, an unequal intermitting pulſe, a palſy of the arms, a continual palpitation of the heat, little urine, a ſyncope or ſwooning, then death is at hand. Some are carried off by an inflammation of the lungs, and the more grievous the diſeaſe the more languid the pulſe. The aſthma, in old perſons, continues till death.

In the paroxyſm, becauſe the body is generally bound, and the wind and humours are carried upwards, the ſpeedieſt aſſiſtance is from emollient and carminative clyſters.

Afterwards uſe frictions of the feet, which have an incredible efficacy; alſo let them be put into warm water; for the feet are almoſt always cold. When there is a violent ſpaſm about the præcordia, hot fomentations are neceſſary, or bladders filled with hot milk, and applied to the part affected; likewiſe nervous liniments are very uſeful, rubbed in with a warm hand.

Internally, antiſpaſmodics ſhould be given, with gentle diaphoretics

And this is all that needs to be adminiſtered in the fit.

Out of the fit, if it proceeds from too great a congeſtion of blood about the breaſt, or from a polypus of the heart, bleeding in the foot will be proper, as alſo ſcarifications; in a ſuppreſſion of the hæmorrhoids, leeches ſhould be applied to the anus; alſo gentle laxatives to cleanſe the *primæ viæ*; likewiſe bodily motion, ſlender diet, and ſoft drink. If there are hypochondriacal or flatulent ſymptoms, then gentle laxatives will be the more neceſſary, together with clyſters. When the menſes or hæmorrhoids are ſuppreſſed, nothing is better than the bath-waters, both for bathing and drinking; or the waters of Selters taken warm and mixed with milk.

When the aſthma proceeds from the driving back ſome impure matter from the ſkin, or from the drying up of ulcers, and the humour is tranſlated to the nervous parts of the breaſt, then gentle diaphoretics will be neceſſary to ſend it back to the ſuperficies of the body.

After which the patient may drink tea made of balm, or elder, or lime tree-flowers, with the leaves of ſcordium, or veronica and fennel ſeeds, or any thing elſe of the ſame kind. Remedies compounded of ſulphur are likewiſe very efficacious in driving back the morbific matter to the ſkin, though outwardly they are hurtful in cutaneous diſeaſes.

The returns of the fits are to be obſerved and guarded againſt, by moderate evacuations, as bleeding, gentle vomits, laxatives, and ſometimes cathartics: but every thing that heats the blood ſhould be carefully avoided, eſpecially about the uſual times of the paroxyſms; becauſe there is generally then a lurking fever, which ought not to be exaſperated by heating food or medicines.

In a dry aſthma proceeding from fumes of lead, an air replete with exhalations from quick-lime, or the vapours of pitcoal; milk, cream, oil of ſweet almonds, emulſions

of ſperma ceti, the fat of animals uſed internally and externally, anſwer every purpoſe.

Country air, and following the plough, are beneficial to reſtore the debilitated tone of the lungs; and tea, made with hyſſop, veronica, ground ivy, liquorice, and daiſy flowers, cannot be enough commended. But ſweet things, in every kind of aſthma, are hurtful, eſpecially in the humid or ſerous, and the hypochondriacal.

Of a Cough.

The cough now under conſideration is a primary diſeaſe, which greatly diſorders the whole body by its vehemence and obſtinacy. Its cauſe is, a flux of ſerous humours from the outward parts and extremities of the body to the lungs, and is ſeldom without feveriſh heats and ſhiverings towards the evening.

It is either moiſt or dry: the former afflicts the phlegmatic, whoſe fibres are lax and muſcles ſoft, and who abound with ſerous and pituitous humours. Women are more liable to it than men; as alſo infants, boys, and old men, more than thoſe in the vigour of their age. The dry cough principally attacks the hypochondriac, the ſcorbutic, the cachectic, and thoſe who are lean and ſlender, and ſubject to convulſive diſorders, and whoſe bodies likewiſe abound with a ſharp ſerum.

The moſt violent of theſe kind of coughs is the *tuſſis convulſiva*, or *ferina*, whoſe effects are ſo violent as almoſt to put the patient in danger of ſuffocation: In children, this is called the hooping cough. Sometimes this is dry in the beginning; or the patient brings up a little thin ſerum, more or leſs ſharp. Sometimes it is moiſt; and then after a very laborious fit, the patient expectorates a ſublivid, and commonly a moſt tough mucus. The extreme parts grow cold, the body is coſtive, the urine and the vital fluids are driven in greater plenty and force towards the breaſt and head; ſo that while the paroxyſm laſts, the face is red and turgid with blood, the veins ſwell, the arteries beat quicker and ſtronger, the eyes are ready to ſtart out of the head, the tears flow, the eyelids ſwell, and ſometimes the blood, after ſneezing, ſprings from the noſe. Sometimes the very veſſels of the lungs burſt, and a ſpitting of blood enſues. Sometimes a hiccup ſupervenes, and then at the ſame time the patient is affected with laborious vomiting; ſome diſcharge their excrements and urine inſenſibly; and the coughing of others is ſo violent as to cauſe ruptures, eſpecially in children.

As to the prognoſtics, a dry cough often turns to a moiſt, by hurting the digeſtion, and rendering the patient cachectic. When a moiſt cough becomes ſuddenly dry, and the breaſt remains oppreſſed, we may conclude that a putrid or hectic fever, or an exulceration of the lungs, are near at hand. In the convulſive cough of children there is danger of a ſuffocation; which cough ſometimes happens in difficult dentition, and in the meaſles. It ſometimes cauſes gibboſity and ruptures in boys; in women abortion; in adults a ſpitting of blood and a phthſis. Coughs that proceed from a ſchirrus of the lungs or other viſcera, are incurable; if from driving in of exanthemata, or breakings out of the ſkin, it grows eaſy as ſoon as they are thrown out again. All coughs attended with loſs of ſleep are bad; as alſo that which is frequent, tedious, obſtinate, and proceeds from a defluction on the lungs. On the contary, a moderate heat in the night time, with an equal breathing ſweat throughout the whole body, a larger flux of urine, and the body open at the ſame time, a more quiet ſleep, and an eaſier expectoration, are certain ſigns that the diſorder is going off.

If the cough is recent, and there is no fever, nor other ſigns of a baſtard peripneumony; or if it is not the conſequence of a pleuriſy or a peripneumony ill cured, by a neglect of ſufficient bleeding; the patient need only abſtain from wine and fleſh for ſome days, and uſe the following remedy.

1. Take 10 drops of balſam of ſulphur, with a bit of candied ſugar; to be uſed twice or thrice in the day.

Recent coughs, after bleeding, are ſoftened by a mucilage of linſeed, or by any common ſweet oil: But the oils are made more efficacious by the addition of a volatile alkaline ſalt, in this manner:

2. Take an ounce and a half of oil of olives, 6 ounces of water, 60 drops of ſpirit of hartſhorn, an ounce of pectoral ſyrup: Take three or four ſpoonfuls every fourth hour.

If the cough will not yield to theſe remedies, then it will be to no purpoſe to rely on pectorals, eſpecially if there is a fever along with it, or if it proceeds from a pleuriſy or peripneumony; for then it is to be cured by bleeding and purging, in the ſame manner as the baſtard peripneumony.

When there is a thin, ſalt, ſharp defluxion, jellies are proper, and a decoction made of barley, ſhavings of hartſhorn, viper-graſs root, and liquorice; or the decoction of turpentine with ſugar; and above all things, oil of ſweet almonds freſh drawn.

When a tuſſis catarrhalis affects the whole habit or body, with a loſs of appetite and a tabes, the cure muſt be attempted with aſſes milk or whey, or milk with equal parts of Selters waters, and eſpecially riding.

In a moiſt, laſting, pituitous cough, the body muſt be kept open with manna, two ounces at leaſt diſſolved in any convenient vehicle, to which may be added, two drams of terra foliata tartari, and a few drops of oil of aniſeed. If the ſtomach will not bear laxatives, clyſters muſt be uſed.

When the cough is outrageous, ſaffron mixed with bezoardics is very friendly to the breaſt; nor are ſtorax pills, mixed with the aromatic pills, leſs beneficial. You may order about 6 grains of the ſtorax pills, with a ſcruple of the aromatic, and give them at bed-time; in the mean while not neglecting the expectorants, oil of ſweet almonds, and ſperma ceti. Likewiſe the thebaic tincture mixt with ſpirit of hartſhorn is not unuſeful for the ſame purpoſe.

But the beſt opiate in this caſe, is the elixir paregoricum: the doſe for children is from 5 to 20 drops; for adults, from 20 to 100 and upwards. It is peculiarly excellent for children in the hooping-cough or chincough.

The patient ſhould, as much as poſſible, breathe a temperate air, ſhunning all ſalted and ſmoak-dried meats, poignant

poignant ſauces, for they render the blood and ſerum ſharp and impure; he ſhould alſo abſtain from malt liquors, but more eſpecially acid wines. The drink ſhould be hydromel; or, if the patient is ſcorbutic, water alone, the cold being firſt taken off with toaſted bread. The vulgar pour hot water upon wheat bran, and drink the infuſion cold, not without ſucceſs.

As to bleeding in this diſeaſe, it is neceſſary for thoſe who are full of blood, and whoſe veins are very prominent; or when the uſual excretions of it are ſuppreſſed; it is alſo a good preſervative, though the perſon has paſt his ſeventieth year. Bliſters may likewiſe be uſed, in obſtinate caſes.

Of a Phthisis, *or Conſumption of the* Lungs.

If an ulcer of the lungs conſumes them ſo far that the whole habit of body waſtes away, it is called a conſumption of the lungs.

This ulcer may proceed from any caſe which may detain the blood in the lungs ſo as to change it into a purulent matter.

The cauſes may be referred.

I. To that temperament of the body which tends firſt to ſpitting of blood, then to an ulcer of the part where the blood has made its way through. This conſiſts,

In a tenderneſs of the arterial veſſels, and in the impetus of a more or leſs acrimonious blood. This is known from a view of the tender and fine veſſels, and of the ſlender make of the whole body, a long neck, a flat and narrow thorax, depreſſed ſcapulæ; the blood of a bright red, thin, ſharp, and hot; the ſkin tranſparent, very white and fair, with a blooming red in the cheeks; the wit quick, ſubtle, and early ripe with regard to the age, and a merry chearful diſpoſition.

In ſuch a debility of the viſcera as diſpoſes their too tenacious contents to produce obſtructions, putrefactions, and to grow acrimonious, whereby the veſſels are corroded, firſt cauſing ſpitting of blood, and then ulcers. This is diſcovered by a ſlight febricula, a little dry cough, an unuſual heat, a redneſs of the lips and mouth, a fluſhing in the face; which are moſt apparent when the new chyle enters into the blood; a propenſity to ſweating when aſleep, a weakneſs, a ſhortneſs of breath increaſing upon the leaſt motion,

In that age when the veſſels have attained their full growth, and will not admit of any further lengthening; when at the ſame time the blood increaſes in quantity, acrimony, and force; which happens between the ſixteenth and thirty-ſixth year of the patient's age.

In an hereditary diſpoſition to this diſeaſe.

Theſe diſpoſitions to a phthiſis are haſtened,

By a ſuppreſſion of accuſtomary evacuations, eſpecially the ſanguineous; as the hæmorrhoids, menſes, lochia, bleeding at the noſe, uſual blood-letting, chiefly in the plethoric, and thoſe who have loſt a limb.

By any violent ſhock of the lungs, by coughing, ſhouting, ſinging, running, violent efforts of the body, anger, and wounds.

By ſharp, ſaline, aromatic aliment, or drink; by the particular manner of living; by another diſeaſe, whence the quantity, acrimony, velocity, rarefaction and heat of the blood are increaſed. Hence it frequently happens from acute fevers, the plague, ſmall-pox, and ſcurvy.

II. Likewiſe this collection of pus may proceed from a peripneumony, which terminates in an apoſtem.

III. When there is an empyema formed, it may corrode, deſtroy, and conſume the lungs, and ſo produce the ſame diſeaſe as if they were waſted away by an ulcer generated in their own ſubſtance

The ſign of an approaching phthiſis is a dry cough, which may continue for ſome months; whereas a ſimple catarrh is attended with ſpitting, and is but of ſhort duration. Vomiting, or a diſpoſition to vomit after eating, excited by the above mentioned cough, is a moſt certain ſign of a phthiſis.

It invades perſons from eighteen to thirty-five years of age; the whole body waſtes away. There is a hectic fever, which is moſt apparent after meals, and is known by the quickneſs of the pulſe, and the redneſs or fluſhing of the cheeks: The matter brought up by the cough is bloody or purulent; if it is ſpit into the fire, it yields an offenſive ſmell; if into a veſſel of water, it falls to the bottom. Though it is thick, it is not glutinous or tenacious, but fluid, and of different colours, *viz.* yellow, green, but moſt commonly of an aſh-colour.

This diſeaſe begins with a ſlight pain, moderate heat, and an uneaſy or oppreſſive ſtraitneſs of the breaſt. When blood is brought up by coughing, it is generally of a florid, ſcarlet colour, and frothy, and proceeds from the lungs with a remarkable noiſe. It is mixt with fibres, films, and ſmall portions of arterial, venal, and bronchial veſſels: The pulſe is ſoft, ſmall, and undulating; the breathing is difficult; and theſe ſymptoms are preceded by a ſaltiſh taſte in the mouth.

Blood is coughed up from the lungs ſometimes without any pain; and if there is a veſſel broken, it moſt commonly flows out in a great quantity at the firſt eruption, and afterwards more ſparingly.

Spitting of blood is cured by copious bleeding every third day, to the fourth time, or till the inflammatory pellicle entirely diſappears. Sydenham adviſes the taking away 10 ounces of blood, to take the common purging potion the next morning, and at night an ounce of diacodium. Hoffman likewiſe adviſes gentle purging and pediluvia, as alſo putting the hands into warm water. For appeaſing the orgaſm of the blood, he thinks nothing better than ſpirit of vitriol, but more eſpecially the tincture of roſes acidulated therewith. Morton very judiciouſly prefers the Peruvian bark. Refrigerating, thickening, ſtyptic lenient remedies, uſed a conſiderable time, are ſeviceable, with which may now and then be mixed the moſt lenient balſamics.

Hoffman adviſes the following powder, as preferable to every thing elſe, in appeaſing the ſpaſmodic ſtrictures of the lungs.

1. Take ſeeds of white henbane, and crabs-eyes, of each a dram; 12 grains of nitre; and one grain of camphor. Make them into a powder.

A prudent uſe of the nonnaturals is likewiſe neceſſary, that may beſt oppoſe the cauſe of the diſeaſe; and chiefly a proper aliment, and manner of living; a milk-diet is preferable to any other.

When

When the cure is performed, it will be neceſſary, by way of prevention, to bleed once in ſix months, for ſeveral years together.

But if, by reaſon of the violence of the diſorder, or the unſkilful uſe of ſtyptics, there ſhould, after the ſpitting of blood, ariſe a difficulty of breathing, which continually increaſes, a wandering ſhivering heat and redneſs of the cheeks, a dry huſky cough, a ſlight hectic fever, a preternatural thirſt, a weakneſs, or ſenſe of weight in the breaſt, it is a ſign that the wound from whence the blood flowed has already begun to change to matter about its lips. Then under the cruſt of dried blood *pus* is formed; and this collection degenerates into a latent VOMICA; and that being broken, becomes an open ulcer of the lungs.

The effects of an ulcer of the lungs thus formed, are generally theſe which follow: An increaſe of the acrimony and quantity of the putrid pus, a dilatation and corroding maceration of the membrane or bag in which it is contained; a converſion of the blood-veſſels and the bronchia into pus; a purulent conſumption of the whole lungs, or of one of its lobes; a continual dry cough, or ſpittle ſhook off by the conſtant concuſſions of the cough; a converſion of the blood flowing into the ulcer into pus; an increaſe of the vomica in the lungs; the burſting of this vomica into the tube of the larynx; the ſometimes ſuffocating diſcharge of the pus, or the daily coughing up of matter, which ſinks in water, and is thick, ſweet, fat, fetid, white, red, yellow, livid, aſh-coloured, or ſtreaked, and which, put into the fire, has the ſmell of burnt fleſh. Sometimes the vomica breaks into the cavity of the thorax; from whence proceeds difficulty of breathing, and the other ſymptoms of an empyema. Then the reſpiration grows exceeding bad; the chyle and the whole maſs of blood are converted into pus; the uſual method of nouriſhment is deſtroyed, the ſolids continually conſume and waſte away; a hectic fever appears, with a ſmall languid pulſe, and the heat in the upper parts intenſe, the cheeks look red, and the face hippocratic. Generally there is an inexpreſſible anxiety towards the evening; an unuſual thirſt; profuſe nocturnal ſweats; red puſtules; a ſwelling of the feet or hands on the ſide affected; exceſſive weakneſs; a hoarſe voice; a falling off of the hair; an itching throughout the body, with watery puſtules; a debilitating diarrhœa, with yellow, fetid, purulent, cadaverous ſtools; a ſuppreſſion of the ſpitting; and then death.

Hence the following prognoſtics may be formed.

An hereditary phthiſis is the moſt dangerous of all, and is incurable unleſs the ſpitting of blood be prevented.

A phthiſis from external violence, that is, proceeding from ſpitting of blood cauſed thereby, is the ſlighteſt of all.

A phthiſis in which the vomica breaks ſuddenly, and the patient eaſily brings up a white, concocted, ſmooth pus, and in quantity proportionable to the ulcer, without thirſt, and with a good appetite and digeſtion, due ſecretions and excretions, is curable, though with difficulty.

Heavy, ſolid, ſtinking, ſweet ſpittle, with night-ſweats, livid cheeks, paleneſs of the face, the noſtrils pinched up, ſinking in the temples, incurvation of the nails, falling off of the hair, and a colliquative diarrhœa, are ſigns of approaching death.

When a vomica is known to be formed in the lungs, then the phyſician muſt endeavour to ripen and break it; which is to be done by milk-diet, riding on horſeback, warm vapours and expectorants: Which done,

1. The blood muſt be guarded and defended againſt the purulent infection, by remedies which are moderately and agreeably acid and ſaltiſh, by vulnerary herbs, ſmooth balſamics given in various forms, in great plenty, and continued a long time.

2. The ulcer muſt be cleared as ſoon as poſſible from the purulent matter, the lips of it cleanſed and conſolidated, which is to be done by liquid medicines, by things which promote coughing, by motion, riding, country-air; theſe are expellents. The cleanſers are detergent balſamics, uſed inwardly and outwardly. The conſolidators are paregorics.

3. The aliment muſt be ſuch as requires the leaſt force to make it paſs freely through the lungs, and be there aſſimilated, and at the ſame time be fit for nouriſhment. Aſſes milk is very ſuitable to this intention, as alſo buttermilk.

Small repeated bleedings are not only beneficial in old coughs, threatening conſumptions, but alſo after purulent ſpitting and hectic ſymptoms have appeared. The quantity of blood to be drawn is from four to ſeven or eight ounces, once in eight or ten days.

Setons, or iſſues made in the ſide of the part that is moſt affected, are very beneficial.

We muſt endeavour to diminiſh the defluxion on the lungs, by bleeding and gentle purging, as well as pectorals, accommodated to the various ſtates of the diſtemper, *viz.* by thickening medicines and attenuants, and ſuch as temperate the hectic fever, with emulſions and aſſes milk, *&c.* and laſtly, by healing the ulcer with balſamics, as opobalſamum; the doſe is 20 drops upon ſugar; but this is not to be taken before due evacuations have been firſt made.

After evacuations, great care muſt be taken that the cough be appeaſed, leſt the lungs ſhould be weakened by the continual agitation.

The moſt ſovereign remedy to reſtore the lungs to their priſtine vigour is to get on horſeback every day; and he that will put himſelf upon this exerciſe for a cure, need not be tied down to any ſtrict rules of diet, nor be debarred from any ſort of meat or drink, ſince the whole ſtreſs of the matter depends wholly on the conſtant and continual exerciſe of riding. Long ſea-voyages have of late been greatly recommended.

In the firſt ſtage of this diſeaſe, when the lungs, trachæa, and glands, throughout the whole pulmonary tube, are ſtuffed with a pituitous matter, ſeparated from the maſs of blood, and the patient is afflicted with a continual cough, eſpecially in the night-time, all proper methods muſt be uſed to ſtop the influx of this catarrh, and to concoct the humours already impacted.

Firſt, Blood muſt be taken from the arm, from ſix to ten ounces, if the patient is plethoric, or accuſtomed to bleeding; this is to be repeated once, twice, or thrice, at proper intervals, eſpecially if the flux of ſerum is like a ſuffocating

suffocating catarrh, together with the copious expectoration of a crude phlegm; or where there is an asthmatic difficulty of breathing, a pain in the side, or the signs of any disposition to a rheumatism, a pleurisy, or a peripneumony.

After bleeding, especially if there is a nausea, or an inclination to vomit, it will be necessary to give an emetic with oxymel of squills [or ipecacuanha wine,] which will sometimes stop the progress of an incipient phthisis. The emetic, if it agrees with the patient, and there is occasion for it, may be repeated every third or fourth day. The best time is towards the evening; and after the operation is over, an opiate will be proper.

Nor must those remedies that soften, lubricate, thicken and concoct the phlegm, be omitted; such as sugar-candy, barley-sugar, old conserve of roses, juice of liquorice, the white and black troches of the London dispensatory; fresh butter in water-gruel, sweet oil or oil of sweet almonds, especially linseed oil cold drawn, of which the patient may take a spoonful every hour, unless there is a diarrhœa, or any other contra-indicating symptoms. He may also eat raisins and figs.

The air should be pure, far from bogs and marshy places, and the smoak of sea-coal; the aliment light of digestion; the drink small, for spiritous liquors should be avoided. The patient should use exercise, and keep his mind as free from passions as possible.

The second stage of this disease may be reckoned from the first formation of the tubercles, till they begin to inflame and putrify, that is, while they remain in a crude state. This is known from the increase of the hectic fever; from the wasting and flaccid state of the musculous flesh, from the dryness of the cough, for the spitting considerably abates; and from the great weight and oppression which is continually felt in the breast.

In this stage all evacuations by vomit, stool, and sweat, are pernicious; for they increase the fever, and accelerate the consumption. Nor is bleeding otherwise proper, than as it prevents an inflammation, and then it must be used with a sparing hand, when there are pleuretic pains, or the patient hath catched a fresh cold.

Besides alterative medicines, taken in small quantities, and at stated times, endeavours must be used to cool the febrile heat of the blood, and decrease the quantity of the noxious humours. The diet must be such as will obtund the acrimony of the humours; as patridges, mountain-birds, poached eggs, oisters, calves-feet and jellies, and soups made therefrom; also craw-fish and other shell-fish, and broths made of their flesh. Likewise spaw-waters, pectorals, hydromel, a milk diet, asses milk, milk-water, millepedes, snails, and the like; together with issues, shaving the head, and proper plaisters

In the third stage of this disease little hopes remain of a cure, unless the ulcers are small and benign.

In this state of the disease, opiates should be sparingly used, even though the cough and want of rest require them, because they not seldom bring on sudden death. Jellies and broths are likewise to be directed; for, in short, there is now more help to be expected from the kitchen than from the apothecary's shop.

The diet should be water-gruel, ptisans of scalded apples, posset-drink, stoned raisins and liquorice, table-beer warmed with a toast, and the like. When the fever is on the decline, chicken broth, poached eggs, *&c.*

If there is occasion, the body must be loosened with clysters of sugared milk, with chamomile flowers, and repeated as occasion requires; then take away ten ounces of blood on the side affected, which should be boldly repeated every, or every other day, according to the urgency of the symptoms.

In colliquative sweats, pearl juleps may be freely given, to which may be added chalk, corals, dragon's blood, or other absorbents. But the Peruvian bark for this pupose, is much better than any other medicine whatever. The patient should not be permitted to sleep too long, the bed-cloaths should be light, and he should be removed to fine subtle air.

Of the Nervous Consumption.

A nervous atrophy or phthisis, is a wasting of the body, without any remarkable fever, cough, or difficulty of breathing; but is attended with want of appetite and a bad digestion; whence the whole body grows languid, and is continually falling away.

At first the body is œdematous, and as it were stuffed with a vapid chyle; the face looks pale and bloated, and the stomach lothes every thing but liquids. The patient is forced to keep his bed sooner than the progress of the decay of his flesh seems to require. The colour of the urine is uncertain, but it is generally very red and small in quantity; sometimes it is pale and copious.

No considerable fever is discernible either by the pulse, heat, or thirst, though the urine is ever so red.

The causes of this disease are generally violent passions of the mind, a too free use of spiritous liquors, and unwholsome air.

Stomachic and nervous remedies are only to be depended upon; such as, chalybeates, antiscorbutics, cephalics, and bitters. If the body be costive, two ounces of tinctura sacra may be taken every fourth evening, and from 30 to 40 drops of elixir aloes, in a glass of white-wine with bitters, before dinner. The elixir of vitriol is excellent in this case, 20, 30, or 40 drops is a dose, in any convenient vehicle, once, twice, or thrice a day. Also about half an ounce of the chalybeate wine, in some proper liquid, in the winter; in the summer, the spaw waters: the usual drink may likewise be made bitter with the *vinum amarum;* but nothing strengthens the stomach more than a decoction of wormwood.

Sometimes the patient may take eight or nine drops of opobalsamum, or spirit of hartshorn, or of sal ammoniac, as friendly to the nerves; nor must he forget exercise and chearful company, with other diversions.

Of an Empyema.

An Empyema is a collection of purulent matter in the cavity of the thorax, between the lungs and the pleura, which always supposes the breaking of a vomica into the said cavity.

Such are the vomicæ or abscesses of the lungs, proceeding from inflammations, from spitting of blood, from a

a thick matter which cannot be expectorated. Of the pleura, from an inflammation, from a wound therein, healed outwardly but open inwardly; from a bruise, or a concealed rupture of it, turning to pus. Of the diaphragm, when, after an inflammation, it suppurates, and breaks on its upper part. Also of the mediastinum and pericardium affected in the like manner.

An empyema may be foreseen from an inflammation of any of the above mentioned parts, which is not terminated and resolved by concoction, revulsion, a crisis, or medicines; but is followed by shiverings, a febricula increasing at night, a wandering heat, a sense of heaviness in the part that was pained, a difficulty of breathing, a want of appetite, and an unusual thirst.

An actual empyema is known from twenty days being elapsed since the inflammation began, without expectoration of the matter; from the signs of a vomica in the five abovementioned parts disappearing; from a new pain, cough, difficulty of breathing, and spitting, arising, and afterwards going off; from a dry cough, a weight on the diaphragm, not being able to lie but on one side, a noise made by the fluctuation of the pus, upon moving the body; from a slow fever, a flushing in the cheeks, hollow eyes, heat in the ends of the fingers, crookedness of the nails, and a swelling of the abdomen.

The consequences of this disease are, a continual accumulation of pus from the ulcer not yet healed; the matter increasing in its acrimony, putrefaction, rank smell, and thinness, by being shut up in a hot, moist place; an impediment in raising the diaphragm and extending the lungs; a shortness and difficulty of breathing, and not easily performed unless in an erect posture, a dread of suffocation when laid down; an inability of lying, but on the affected side; a constant dry cough, with anxiety; a maceration and corrosion of the lungs, pleura, diaphragm, pericardium, and even of the heart itself, converting them gradually into filthy corruption; whence a hectic fever, quick, small pulse, constant redness of the cheeks, loss of appetite, perpetual thirst, extreme weakness, and fainting fits. Hence all the fluids become unfit for nutrition, circulation, or any other office: The consequence of which is, a wasting of the whole body; a putrefaction of the fluids, which may be discharged through the corroded lungs, or carried downwards by a fatal sanious diarrhœa; night-sweats, pustules in the face, crooked nails, a shining yellowness of the skin, and a hippocratic countenance.

The cure of this disease is different, according to its different cause and state.

When a vomica or abscess is known to be formed in any of the parts before mentioned, all endeavours are to be used, that it may be speedily broken and determined to the outward parts, which must be attempted by actual or potential cauteries, or by incision and proper motion.

When the vomica is actually broke, then it is to be evacuated by the mouth, if nature seems to encourage it; or by urine, if there appear any signs in it of passing that way; or by an aperture of the thorax by a proper instrument. See Surgery.

In general, all inflammations of the lungs or pleura are followed by an adhesion of these parts, which allow nature to make a passage externally: And it is common in abscesses of the pleura and intercostal muscles to find them break outwardly; nor is it uncommon even in the lungs. Therefore, when there is an adhesion, no other operation is necessary than to open the tumour with a lancet, when the pus is formed; and if the suppuration is so plentiful as not to admit the healing of the outward ulcer, it may be kept open with a hollow tent.

Hoffman gives an instance of a person, who, after a peripneumony, fell into an empyema, and was cured by taking milk boiled with sugar of roses. The quantity was three pints a-day. As also balsamic pills made of flowers of sulphur, oil of sweet almonds, sperma ceti, venice turpentine, saffron, and oil of aniseed. Likewise a powder made of crabs eyes, sperma ceti, sugar, myrrh, liquorice powder, and bole armoniac.

Of the Scurvy.

This distemper chiefly affects the inhabitants of cold northern countries, and especially those who live in marshy, low, fat and moist soils, near stagnating water, whether fresh or salt. Those who live idle sedentary lives are most subject, chiefly in the winter, to the attacks of this disease; as also those who feed upon salted and smoak-dried flesh or fish, sea-biscuit, stinking water, unfermented farinaceous vegetables, pease, beans, sharp salt old cheese; likewise those who are subject to melancholic, maniacal, hysteric, or hypochondriacal disorders.

It is known by spontaneous weariness, heaviness of the body, difficulty of breathing, especially after bodily motion; rottenness of the gums, a stinking breath, frequent bleeding of the nose, difficulty of walking; sometimes a swelling, sometimes a falling away of the legs, in which there are always livid, plumbeous, yellow, or violet-coloured spots; the colour of the face is generally of a pale tawney.

The first state of this disease begins with unusual laziness, spontaneous weariness; the patient loves to be in a sitting or lying posture; there is a pain in all the muscles, as if he was over tired, especially of the legs and loins; when he wakes in the morning, all his joints and muscles seem to be tired and bruised.

In the second state, the gums swell, grow painful, hot and itching, and bleed upon the least pressure; the roots of the teeth become bare and loose; he feels pains in all the external and internal parts of the body, imitating distempers proper to the various parts.

In the third state, the gums at length grow putrid, with a cadaverous smell; when they are inflamed, blood distils from them, and a gangrene ensues; the loose teeth by degrees grow yellow, black, and rotten; the sublingual veins become varicous, and like rings; there are often fatal hæmorrhages, which break out from the external skin, without any appearance of a wound from the lips, gums, mouth, nose, lungs, stomach, liver, spleen, pancreas, intestines, womb, kidneys, *&c.* Obstinate ulcers arise, of the very worst kind, which no applications will cure, and which are apt to turn to a gangrene; they break out in all parts, but especially the legs, and are attended with a stench. There is a kind of an itch and dry scabs, with

with a dry and mild leprosy. The blood drawn from a vein is black, grumous, thick, and yet wants its due consistence in the fibrous part; the serum is salt, sharp, and abounding with a yellowish green mucus on its surface. There are gnawing, rending pains, quickly shifting from place to place, which grow more violent in the night, affecting all the joints, bones, and viscera.

In the fourth state, there are fevers of various kinds, which bring on an atrophy; sometimes diarrhœas, dysenteries, or violent stranguries; as also faintings and mortal anxieties, a dropsy, consumption, convulsions, trembling, a palsy, contractions, black spots, voiding of blood upwards and downwards, a putrefaction and consumption of the liver, spleen, pancreas, mesentery. Now the contagion spreads very quick.

The first sign of the approach of this disease is commonly a change of colour in the face, which becomes pale or yellowish, and bloated, with a listlessness, and an aversion to exercise. The caruncles of the eyes appear of a greenish cast, and yet in other respects the patient seems in perfect health. However, the change of colour in the face does not always precede the other symptoms, though it constantly attends them. Then an universal lassitude supervenes, and a stiffness and feebleness of the knees, with a difficulty of breathing on the least motion. Soon after this there is an itching of the gums, which swell, and are apt to bleed on the least friction. Then they become livid, soft and spongy, and afterwards extremely putrid and fungous. This rottenness of the gums is an inseparable sign of this disease. These are not only subject to bleed, but there are hæmorrhages from different parts of the body.

The skin is dry throughout the whole course of this disease, except towards the last, and in many it is rough. In some it appears like the skin of a goose; but it is most frequently smooth and shining. It is stained with blue, purple, livid, or black spots; some of which are small, and others of a hand's breadth, when the disease is advanced. They are chiefly on the legs and thighs, but sometimes on the arms and trunk of the body. Some have a swelling of the ankles in the evening, which disappears in the morning. In a little time it advances gradually up the leg, and the whole member becomes œdematous. Hurts, bruises, wounds healed up, and fractured parts, always become scorbutic first. Old ulcers will emit a thin fetid sanies, mixed with blood, and at length coagulated gore will lie on the surface of the sore like a cake. As the disease increases, they shoot out a soft, bloody fungus resembling bullock's liver, which sometimes will rise to a monstrous size in a night's time. The slightest bruises and wounds of scorbutic persons degenerate into such ulcers, and are easily distinguished from all others, by being putrid, bloody, and fungous.

To prevent the scurvy at land, it will be proper to chuse a warm, dry, pure air, with a diet of easy digestion, consisting chiefly of a due mixture of animal and vegetable substances; for those are most liable to it who live in marshy, wet soils, and in places subject to great rains and fogs; or in damp, low apartments, unless they keep constant fires, and their chief food be flesh broths, with plenty of fresh greens or vegetables, and well-baked bread made of wheat-flour; as also a chearful glass of some good wholesome fermented liquor. Cleanliness, entertaining amusements, and moderate exercise, will also be good preservatives in these cases. In garrisons, the soldiers should be kept as dry, clean, and warm as possible, and their provisions should be as wholesome as can be procured, with plenty of good vegetables, particularly sallads of garden-cresses.

The best method of preventing the scurvy at sea will appear from the effects which Dr Lind has observed several medicines have had, especially those which have been greatly recommended as preservatives. On the 20th of *May* 1747, being on board the Salisbury at sea, he took twelve scorbutic patients under his care. They had putrid gums, spots, and lassitude, with weakness of their knees. They had a proper apartment in the forehold: their diet was water-gruel sweetened, in a morning; sometimes mutton broth for dinner, sometimes light puddings, boiled biscuit with sugar, *&c.* and for supper, barley and raisins, rice and currants, sago and wine, and the like. Two of these were ordered each a quart of cyder in a day; two others twenty-five drops of elixir of vitriol, three times a-day, upon an empty stomach, using a gargle acidulated with the same. Two others took two spoonfuls of vinegar three times a-day; having their gruels, other food, and gargles well acidulated with it. Two of the worst patients, with the tendons of the ham rigid, were put under a course of sea-water, and drank about a pint every day, more or less, according to its operation, which was intended to be as gentle physic. Two others had each two oranges and one lemon given them every day, which they eat with greediness upon an empty stomach, at different times. This course was continued but six days, because no more fruit could be allowed. The two remaining patients took the bigness of a nutmeg, three times a day, of an electuary made of garlic, mustard seed, balsam of Peru, and gum-myrrh; using for common drink barley-water well acidulated with tamarinds; by a decoction of which, and cream, they were gently purged three or four times during the course.

The oranges and lemons had the best effect; for one of those who had taken them, was at the end of six days fit for duty; and he took nothing more but a gargle of the elixir of vitriol for his gums, which were not quite sound, and so recovered his health entirely. The other being more recovered than any of the other patients, was appointed to look after them. Next to the oranges the cyder had the best effects, though it was not very good, being prick'd; for those who drank it were in a fairer way of recovery at the end of the fortnight, the time allowed for making the experiments, than any of the rest. Elixir of vitriol did no good unless as a gargle, nor yet any of the rest of the medicines. Oranges are preferable to lemons; for by these the lord Anson's people were so speedily and surprisingly recovered at the island of Tinian. Besides, Mr Murray affirms, from experience, that oranges and lemons, when properly and sufficiently used, are an infallible cure in every stage and species of this disease, if there is any degree of natural strength left, and where a diarrhœa, lientery, or dysentery, are not joined to the

the other ſymptoms. He obſerves farther, that at the iſland of St Thomas, fifty men belonging to the Canterbury, and ſeven to the Norwich, who were in all the different ſtages of this diſtemper, were cured in little more than twelve days.

But as oranges and lemons are apt to ſpoil, let the juice of theſe fruits be well cleared from the pulp, and depurated by ſtanding ſome time; after which it may be poured off from the groſs ſediment. Let it then be poured into any clean open veſſel of china or ſtone-ware, which ſhould be wider at the top than at the bottom, that it may evaporate more readily. But a china baſon or punch-bowl is moſt proper, on account of the form. Put this into a pan of water over a clear fire; let the water come almoſt to boil, and continue nearly in that ſtate, with the bowl full of juice in the middle of it, till the juice is found of the conſiſtence of a thick ſyrup when cold. The ſlower the evaporation of the juice is, the better; that is, it ought to continue twelve or fourteen hours over the fire: When it is cold, it is to be corked up in a bottle for uſe. Two dozen of good oranges weighing five pounds four ounces, will yield one pound nine ounces and a half of depurated juice; and when evaporated, there will remain five ounces of extract, which in bulk will be equal to leſs than three ounces of water. So that twelve dozen of oranges may be put in a quart bottle, and preſerved ſeveral years. The ſame may be ſaid of lemons. When this is mixed with water and made into punch, few are able to diſtinguiſh it from the freſh juice mixed up in the ſame manner. However, when the freſh fruit can be had, the fragrancy of the peel may contribute ſomewhat to the cure of the ſcurvy; and when theſe are wanting, the ſame thing may be obtained from a few drops of their eſſence, or the aromatic oil contained in their rinds; and if a ſmall quantity of this be added to the extract, it will give it the ſmell and fragrancy of the freſh fruit in great perfection. Or rather add a little of the outer peel to the extract a little before it is taken off the fire, and then the niceſt taſte will not be able to diſtinguiſh the difference between the freſh fruit and this. The virtues of this extract, thus made, lie in ſo ſmall a compaſs, that a bottle will ſerve one man at ſea ſeveral years; for in the making of it there is little or nothing flies off beſides the water.

It will likewiſe be of great uſe to ſeamen to have gooſeberries, and the like, preſerved in bottles in the ſame manner as the paſtry-cooks; as alſo ſmall onions pickled in vinegar, cabbage, french beans, *&c.* may be preſerved, by putting them in clean dry ſtone-jars, with a layer of ſalt at the bottom, then a thin layer of the vegetable covered with ſalt, and ſo alternately till the jar is full. Then the whole muſt be preſſed down with a weight, and its mouth quite ſtopped that no air or moiſture may enter. Thus the vegetable may be kept freſh and green for a whole year. At the time of uſing, the ſalt is to be waſhed off with warm water. This is the manner by which they preſerve that never-failing remedy, Greenland ſcurvy-graſs. Every common ſailor ought to lay in a ſtock of onions, for they are a great preſervative at ſea. The Dutch ſailors are preſerved from the ſcurvy by pickled cabbage. Portable ſoup may be carried to all places. When the ſcurvy begins to make its appearance, ſailors ſhould be abridged in the ſame degree of their allowance of beef and pork, and eat them with muſtard and vinegar; but the peaſe ought always to be ſerved out in full allowance. It muſt be obſerved likewiſe, that a ſoup of boiled cabbage and onions will cure an adventitious ſcurvy in its firſt ſtage, either at land or ſea, in any part of the world.

Beſides freſh and preſerved fruits and vegetables, fermented liquors of all ſorts are good, but more particularly cyder. Among theſe are included many wines of every kind; or the juices of fruits may be fermented with ale. Poor people that winter in Greenland under vaſt diſadvantages in point of air and diet, preſerve themſelves from the ſcurvy by ſpruce-beer, which is their common drink. Likewiſe the ſimple decoction of fir-tops has done wonders. The ſhrub black ſpruce of America makes this moſt wholeſome drink juſt mentioned, and affords a balſam ſuperior to moſt turpentines. It is of the fir kind. A ſimple decoction of the tops, cones, leaves, or even of the green bark or wood of theſe, is an excellent antiſcorbutic; but perhaps it is much more ſo when fermented, as in making ſpruce-beer. This is done by moloſſes, which by its diaphoretic quality makes it a more ſuitable medicine. By carrying a few bags of ſpruce to ſea, this wholeſome drink may be made at any time. But when ſpruce cannot be had, the common fir-tops uſed for fuel in the ſhip ſhould be firſt boiled in water, and then the decoction ſhould be fermented with moloſſes; to which may be added a ſmall quantity of wormwood and root of horſe-radiſh. The freſher it is drank, the better. When other things are wanting, tar-water may be fermented in the ſame manner.

Thoſe who have been weakened by long fits of illneſs ſhould have the ſcurvy prevented by panada of bread newly baked, with a few drops of the extract of lemons, and a ſpoonful of wine; as alſo oatmeal and rice, gruels, flummery, ſtewed barley, with raiſins or currants, ſago, and wine, *&c.* But more particularly pickled cabbage, and ſmall onions boiled with the portable ſoup made weak. Moſt of their food ought to be acidulated with orange or lemon juice; and then as their ſtrength increaſes, they ſhould be indulged with more ſolid food. But before this, they ſhould have a ſmall quantity at a time and often, and they ſhould be brought back to their labour by little and little. Exerciſe on a deal-board, with the ends laid on two cheſts, will be very proper; becauſe it promotes the circulation, and ſtrengthens the fibres, without any loſs of ſpirits.

Bad air of any kind has a bad effect upon a ſhip's crew; to remedy which, a red-hot loggerhead ſhould be put into a bucket of tar, and moved about, ſo that all the ſhip once or twice a-day ſhould be filled with this wholeſome antiſeptic vapour. In a moiſt air, whatever promotes perſpiration is proper; ſuch as dry linen, cleanlineſs, uſing the fleſh-bruſh, garlic or raw onions before going into the rain, and keeping the bedding dry. Plenty of muſtard and onions ſhould be uſed with their victuals.

The cure of this diſeaſe has been in a great meaſure anticipated by the means of prevention, inſomuch that little remains to be ſaid about it. The diet ſhould be light

light and eaſy of digeſtion, ſuch as broths or ſoups made of freſh meat, with plenty of vegetables, ſuch as cabbage, coleworts, leeks, onions, *&c.* The bread ſhould be freſh and well baked; and ſallads of all kinds are beneficial, but more particularly dandelion, ſorrel, endive, lettuce, fumitory, and purſlane; to which may be added, ſcurvy-graſs, creſſes, or the like, to correct the cooling qualities of the former. Summer fruits are all good, as oranges, lemons, citrons, apples, *&c.* The drink may be good ſound beer, cyder, or Rheniſh wine. Phyſic is never neceſſary if the freſh broths and greens keep the belly open, and paſs freely by urine, ſweat, and perſpiration. If otherwiſe, the patient may take a decoction of tamarinds and prunes with a diuretic ſalt; and on intermediate days he may be ſweated with camphorate boluſes of theriac, and warm draughts of a decoction of the woods, of twelve or fifteen grains of the ſquill pills of the Edinburgh diſpenſatory.

Milk of all ſorts, if it agrees with the conſtitution, will be very beneficial, as well as whey, which is preferable. Sal polychreſt is uſe as a mild purgative and excellent diuretic. The ſcorbutic juices, qualified with the juice of Seville oranges, are proper, eſpecially mixed with the clarified whey, with ſweating twice or thrice a-week with the ſaid juice mixed with ſack-whey; for this is an evacuation which ſcorbutic perſons bear the beſt. When there is no danger of an hæmorrhage, warm baths, with roſemary, marjoram, thyme, *&c.* may be good. In the winter-time, genuine ſpruce-beer, with lemons and orange juice, is proper; or antiſcorbutic ale, made of an infuſion of wormwood, horſe-radiſh, muſtard-ſeed, and the like; and it may be made laxative with the addition of ſenna. It muſt be drank while pretty freſh or new. Van Swieten ſays, he has often ſeen whole families cured of the ſcurvy, in Holland, by the uſe of a caſk of ale, in which were put heads of a red cabbage cut ſmall, twelve handfuls of creſſes or ſcurvy-graſs, and a pound of freſh horſe-radiſh previouſly infuſed.

When the gums begin to itch and are ſpungy, uſe a gargle of the bark infuſed in brandy. When the putrefaction increaſes, uſe barley-water and honey of roſes, acidulated with a mineral acid. The fungus muſt be kept down and, when neceſſary, cut away. The ulcers of the gums muſt be checked with a touch of ſpirit of ſalt, or oil of vitriol diluted. When the legs are ſwelled, or œdematous, gentle frictions are to be uſed at firſt with warm flannel, or with woollen cloths charged with the fumes of benjamin and amber, provided the ſwelling be ſmall, ſoft, and not very painful, rolling them up afterwards with an eaſy bandage from below upwards: But if they are much ſwelled, ſtiff, and painful, they muſt be fomented with a diſcutient fomention, or rather the ſteam of the fomentation ſhould be received through a blanket rolled round the limb. This operation, repeated night and morning, will render the contracted joints ſupple. After this has been continued for half an hour, the parts are to be anointed with palm oil. If a vegetable diet does not reduce the limb, ſweat it with burning ſpirits, or bags of warm ſalt.

Ulcers of the legs muſt be treated with very gentle compreſſion, to keep the fungus under; and the ſame applications muſt be uſed as to the rotten gums. Mr. Murray has found a ſtrong tincture of the bark of great ſervice in ſcorbutic ulcers. In dangerous hæmorrhages the mineral acids muſt be given by a little at a time and often; ſuch as the ſpirit or elixir of vitriol, together with ſmall doſes of the Peruvian bark.

A ſcorbutic diarrhœa ſhould not be ſuddenly ſtopt at ſea, but the peccant humour muſt be gently evacuated with ſmall doſes of rhubarb, and the perſpiration kept up with a little theriac or diaſcordium, with other warm diaphoretic and ſtrengthening medicines. In extreme caſes, opium may be given more freely. The diet muſt be glutinous and ſubaſtringent, with ſtrong rough red wine diluted. Sometimes five grains of alum may be given with the diaſcordium, eſpecially when blood is evacuated in great quantities. The moſt effectual remedy in ſcorbutic dyſenteries is an infuſion of ipecacuanha in brandy, given in ſmall doſes, and often repeated.

Phyſicians refer the different ſymptoms of this diſeaſe to different ſalts; but their different and far-fetched corrections of theſe ſalts are plainly ridiculous. Water is the known ſolvent of all ſalts, and this intention will be beſt anſwered by pure and light ſimple water. The univerſal remedy for a ſcurvy conſiſts in mineral waters.

After mineral waters, nothing is more effectual in correcting a ſcorbutic acrimony than a milk diet, or whey alone, or impregnated with the juices of antiſcorbutic herbs, ſuch as ſcurvy-graſs and water creſſes.

As to evacuations, bleeding ſhould be uſed with the greateſt caution; and none but the gentleſt purges ſhould be given, ſuch as ſenna, rhubarb, or manna. The diuretics ſhould not be ſtronger than the decoction of the roots of parſley, celery, fennel, and aſparagus. The ſafeſt diaphoretics are, dulcified ſpirit of nitre, flowers of ſulphur, ethiops mineral; infuſions, in the manner of tea, of Paul's betony, carduus benedictus, ſcordium, and elder-flowers.

In the hot or alkaline ſcurvy, ſcurvy-graſs is too warm to be adminiſtred alone, and ſhould be corrected with acids, ſuch as wood-ſorrel, the juices of citrons, oranges, barberries and pomegranates. Or mix the conſerve of ſcurvy graſs with an equal quantity of the conſerve of wood-ſorrel, and give it twice or thrice a-day, with ſome antiſcorbutic water. This ſhould be accompanied with milk-meats, almond-emulſions, barley-broths, water-gruel, chicken-broths, with endive, lettuce, ſorrel, and creſſes, interpoſing, at proper intervals, gentle laxatives and diuretics.

When the ſcurvy proceeds from muriatic ſalts, which happens to thoſe who live on ſmoaked or high-ſalted fiſh or fleſh, and have corroding ulcers, a ſtinking breath, putrid gums, a thick and ſaltiſh urine, as is generally obſerved in old ſailors; then whey, long and copiouſly drank, produces happy effects; as alſo citrons, China oranges, and ripe fruits; whereas ſpirituous and volatile antiſcorbutics are generally detrimental. Hoff.

But if cruſty black ulcers require external remedies, we ſhould only uſe preparations of the yolk of an egg, myrrh, olibanum, ſaffron, oil of roſes, and Peruvian balſam. When there is an exceſſive impurity of the humours tending to putrefaction, ſcarifications will induce

a gangrene, which may be prevented by lime water, exalted with camphorated ſpirit of wine and ſal ammoniac.

But fomentations and cataplaſms of the common hemlock, frequently repeated and duly continued, are found more effectual than all other remedies.

Of the Dropsy.

Dropsies are of various kinds; but thoſe uſually treated of by authors are the anaſarca, aſcites, and tympanites.

When the lymph ſtagnates throughout the whole habit of the ſubcutaneous fat, or is ſhed therein, it produces an anaſarca, which extends itſelf alſo to the abdomen and ſcrotum.

When the water is collected in the duplicature of the peritonæum, in the cavity of the abdomen, between the peritonæum and the viſcera of the abdomen, or in the dilated cavities of the glands and veſſels contained in the abdomen, it is called an aſcites. If the dropſy is owing to the rarefaction of ſome ſteam or vapour, ariſing from water, pus, ichor, or air, pent up and heated till they putrefy, then it is a tympany.

The cauſe of theſe diſeaſes may be, a family diſpoſition thereto; a haſty drinking too great a quantity of cold water, and its not being evacuated upwards or downwards, or by ſweat, or urine excited by heat or motion; acute diſeaſes, eſpecially the moſt ardent, attended with unquenchable thirſt, or otherwiſe; a lienterious dyſentery of a long continuance; all obſtinate obſtructions of the viſcera; and a ſchirrus of the liver, ſpleen, pancreas, meſentery, kidneys, womb, or inteſtines; the jaundice; a violent quartan ague of long duration; a lientery; a diarrhœa; a long dyſentery; the cœliac paſſion, an empyema; a conſumption; the gout; too great evacuations, chiefly the blood; the drinking of ſharp, fermented, and ſpirituous liquors; the feeding on tenacious and hard aliment; very large and numerous hydatides hanging in the cavity of the abdomen; melancholy; the ſcurvy, and the like.

The firſt ſign of the approach of this diſeaſe is the ſwelling of the feet and ancles, which in the evening will pit, if preſſed with the fingers; which ſwelling diſappears in the morning, eſpecially if there begins to be a difficulty of breathing. And yet it muſt be remembered, that pregnant women, or whoſe menſes are ſtopped, as alſo when ſuddenly freed from an inveterate aſthma, are affected with the like ſwelling. When the feet and legs are diſtended to the utmoſt, the waters ruſh into the abdomen, and cauſe it to ſwell by little and little, till at length the more noble viſcera are affected therewith, and the patient is ſoon overwhelmed with the deluge. In proportion as the diſeaſed parts increaſe in bulk, the reſt fall away: at the ſame time the difficulty of breathing, paucity of urine, and intenſe thirſt, the three principal ſymptoms, grow more intolerable

When the abdomen is ſwelled, it will ſound, when ſtruck, if the diſeaſe is a tympany. In the aſcites there is a noiſe of the fluctuating water upon bodily motion, unleſs the waters are incloſed in a cyſtis or bag.

Beſides the above-mentioned ſymptoms, there is a heavineſs, a torpor, a coſtive body, and at length a ſlow fever; the patient never ſweats. In proceſs of time, the ſtagnating waters, being pent up in a hot place, become acrimonious; hence ulcers, gangrenes, bleeding at the noſe, a protuberance of the navel, a mortification of the viſcera, and death.

The curative indications in an anaſarca, as well as in an aſcites, are to reſtore the humours to their natural fluidity; to invigorate the languid circulation; to brace up and ſtrengthen the relaxed ſolids; to promote the ſecretions; and to carry off the redundant ſtagnating juices.

Strong draſtic purges, ſteel medicines, abſorbents, detergents and ſtomachics, are beſt ſuited to anſwer theſe intentions.

The firſt thing to be done is to evacuate the ſerous humours by cathartics.

There are two things of uncommon efficacy in the dropſy; theſe are, elaterium and antimonial wine, eſpecially for thoſe which are not eaſily purged; two grains of the former is a proper doſe for moſt conſtitutions.

As for the antimonial wine, an ounce and a half, or two ounces, as the patient's ſtrength will admit, given in the morning, will in due time free the abdomen from the load of water. If it does not purge downwards as well as upwards, mix it with ſyrup of buckthorn after the third or fourth doſe.

Some greatly recommend Bontius's pills for the dropſy, the doſe of which is from half a ſcruple to a ſcruple; but Heiſter preſcribes them from half a dram to a dram.

Mayrne affirms, that mercurius dulcis, without doing any miſchief to the body, acts directly upon the morbific cauſe, and if poſſible deſtroys it. If a ſalivation follows, it is not dangerous, but may be prevented if the mercurial be joined to an active cathartic.

Many praiſe the juice of the root of iris paluſtris lutea; and we have an inſtance of its efficacy in a moſt deplorable dropſy, in the *Med. eſſays;* eighty drops of which were given every hour in a little ſyrup of buckthorn, which brought away many quarts of water by ſtool the firſt night; the quantity was daily increaſed till it came to two drams, and at laſt was mixt with a fourth part of the ſyrup, and given by ſpoonfuls.

Sometimes purgatives are to be entirely omitted, when the patient is of a weak conſtitution, or women ſubject to vapours; and then diuretics only ſhould be made uſe of; among which, thoſe are moſt powerful which conſiſt of lixivial ſalts.

Boerhaave likewiſe propoſes to attenuate the humours by ſmall doſes of mercurial preparations, to be taken every other morning, in a little pulp of a roaſted apple; as half a grain of turbith mineral, with ten grains of white ginger; or one grain of red precipitate, with ſix grains of nutmeg; or ſeven grains of calomel, with eight of winter's bark.

Some have been cured by a pertinacious abſtinence from all liquids, living upon ſea biſcuit with a little ſalt, and a very little rich wine. Externally, frictions of the parts have been found beneficial.

Of

Of the Hydrocele, *or* Dropsy *of the* Scrotum.

The hydrocele, called the dropſy of the ſcrotum, *hernia aquoſa*, and the dropſy of the teſticle, is an acqueous tumour of the ſcrotum. Though authors mention ſeveral kinds, there are but two. The firſt is, when the water is contained in the tunica vaginalis; the ſecond, when it is contained in the cellular membrane of the ſcrotum. This laſt is almoſt always complicated with an anaſarca, a kind of dropſy which conſiſts in the extravaſation of the water which lodges in the cells of the membrana adipoſa. The hydrocele in this caſe is known without any difficulty; for the ſkin is ſhining and ſoft, yielding eaſily to a ſlight impreſſion, which will remain pitted for ſome time; the penis is alſo ſometimes prodigiouſly ſwelled by the liquor which inſinuates into the cellular membrane. There are none of theſe ſymptoms in the dropſy of the tunica vaginalis.

In the dropſy of the cellular membrane of the ſcrotum, ſome recommend the puncture with a trochart; others, to make ſmall apertures here and there with the point of a lancet; others, to put a ſmall ſkane of ſilk through the ſkin with a needle, and to let it remain as a ſeton, till all the water is drained off. But the two firſt methods yield very little relief, and the laſt may be more likely to induce a gangrene. Nor is there occaſion for any operation at all, becauſe the cellular membrane of the ſcrotum is nothing but a continuation of the membrana adipoſa; and therefore ſcarifications made in the ſkin of the ſmall of the legs will effectually empty the ſcrotum.

Yet ſometimes there falls ſo great a quantity of water into the ſcrotum that the diſtenſion is very painful, threatening a mortification. Likewiſe the prepuce very often is ſo exceſſively dilated and twiſted, that it hinders the patient from making water.

In theſe caſes there ſhould be an inciſion made on each ſide the ſcrotum, three inches in length, quite through the ſkin, into the cells which contain the water; and likewiſe two or three, half an inch long, in any part of the penis, with a lancet or knife.

The dropſy of the tunica vaginalis is cauſed by an exceſſive accumulation of a ſeroſity, which is naturally ſeparated in the internal ſurface of that tunic in a ſmall quantity, to moiſten and lubricate the teſticle. Authors have hitherto diſtinguiſhed them into two ſorts: the one on the inſide of the tunica vaginalis: and the other on the outſide, between that and the ſcrotum, which they ſuppoſe to proceed from water in the dropſy aſcites. But anatomy ſhews the abſurdity of this opinion; for beſides that perſons afflicted with this kind of hydrocele have ſeldom any other dropſy, and thoſe who have the aſcites are free from this hydrocele, the tunica vaginalis is like a purſe quite ſhut up on the outſide of the abdomen, ſo that the water cannot inſinuate into it from any part.

As to the notion that the water falls from the abdomen into the interſtice between the tunica vaginalis and the ſcrotum, it is equally impoſſible. For though in the inteſtinal rupture the gut falls into this place, yet it brings the peritonæum along with it, and that will prevent the egreſs of the water. This is a circumſtance the ancients were unacquainted with, and the moderns have not ſufficiently attended to.

This diſorder is ſeldom attended with pain in the beginning, contrary to what happens in the hernia of the epiploon, and of the inteſtine; nor is it often the effect of any accident. It never diminiſhes when once begun, but generally continues to increaſe; but in ſome perſons not ſo quick as in others. In one perſon it will grow to a very painful diſtenſion in a few months; in another it ſhall not be troubleſome in many years; nay, it ſhall ceaſe to ſwell at a certain period, and afterwards continue in that ſtate without any notable diſadvantage. But this is rare.

In proportion as it enlarges, it becomes more tenſe, and then is ſaid to be tranſparent: but this is not always the caſe; for ſometimes the ſcrotum is very much thickened, and the water itſelf opake; ſo that to judge poſitively if there be a fluid, we muſt be guided by feeling a fluctuation; and though ſometimes it is not very evident, yet we may be ſure there is a fluid of ſome kind, if we are certain that the diſtenſion of the tunica vaginalis makes the tumour.

When a gut, or the omentum, form the ſwelling, it is ſoft and pliable, unleſs inflamed, and uneven in the ſurface, and reaches from the ſcrotum into the very abdomen; whereas the hydrocele is tenſe and ſmooth, and ceaſes before, or when it arrives at the rings of the abdominal muſcles.

When the teſticle is increaſed in ſize, the tumour is rounder, and, if not attended with an enlargement of the ſpermatic veſſels, the cord may be eaſily diſtinguiſhed between the tumour and the abdomen; but without this the pain or the very great hardneſs will diſcover it to be a diſeaſe of the teſticle.

As to the cure, little is to be expected either from inward medicines or outward applications. Therefore it will be moſt adviſeable to wait till the tumour becomes troubleſome, and then to tap it with a lancet.

Of the Jaundice.

The jaundice is a diſeaſe which is principally diſcovered by the yellow tincture of the ſkin, but moſt diſtinctly in the coats of the eyes, where it gives the firſt notice of its invaſion.

The ſymptoms are, heavineſs, inactivity, laſſitude of the whole body, anxiety, uneaſineſs about the hypochondria, ſickneſs at the ſtomach, oppreſſion in the breaſt, difficult reſpiration, a dry and harſh ſkin, coſtiveneſs, hard white excrements, yellow high-coloured urine, which will tincture linnen or paper with a ſaffron hue; there is a bitter taſte in the mouth; and all objects ſeem to be diſcoloured.

The immediate cauſe of a jaundice is an obſtructed excretion of the bile from the veſica felis and liver into the duodenum; which being forced back upon the liver, mixes with the blood, by which it is carried into the whole body, whence the ſkin and urine will be tinctured with the colour of the bile.

This obſtruction may be occaſioned by any thing in the duct, which plugs up the paſſage, or by external preſſure cloſes its mouth, or by a ſpaſm contracting the fibres thereof. Hence we may conceive why the jaundice ſucceeds the flatulent colic, why pregnant women are

are subject to this disease, and why spasms of hypochondriacal and hysterical persons produce the same effect. Sudden frights, the generation of too great plenty of bile, schirrhous tumours or ulcers of the liver, obstructions of the menses, obstinate intermitting fevers, and the bites of venomous animals, will also produce this disease.

The prognostics of this disease differ with regard to the patient's age, habit, strength, and constitution, as well as with respect to the virulence or mildness of the causes, and its duration. When the patient is young, and the disease not complicated with any other, such as a quartan ague, the affectio hypochondriaca, or an obstruction or scirrhus of the liver, and has not continued long, it is easily cured. But if after the cure it frequently returns, with a yellow greenish colour, and an induration of the liver, it generally terminates in a hectic or an hæmorrhage. A jaundice arising from violent transports of anger, or the spasmodic stricture of the intestines or biliary ducts, caused by a drastic purge or emetic, is easily cured if taken in time; but if encouraged by grief, or the body is weakened by a previous disorder, the cure is more difficult.

Emetics are highly proper in the cure of the jaundice, and yield speedy relief, if the disease does not proceed from violent anger, spasms of the stomach, a cardialgia, a spasmodic colic, or a stone lodged in the cystic duct, exciting a violent uneasiness about the præcordia. But when a bilious sordes, lodged in the duodenum, and closing up the orifice of the ductus choledochus, intercepts the passage of the bile; or when a tenacious, moveable, and not highly concreted bilious matter, plugs up the hepatic ducts, emetics are of singular efficacy in evacuating it. A scruple of ipecacuanha, with a grain of tartar emetic, will be a proper dose; or two grains of tartar emetic, in a draught of generous wine, or in an infusion of manna, drinking water-gruel after it.

Likewise in this case, after emetics, cathartics will be proper, compounded of aloetics and mercurials: Then saponaceous attenuants, preparations of tartar, and volatiles.

And here we must recommend the terra foliata tartari, otherwise called tartarum regeneratum, [and by the college, Sal diureticus,] as the greatest dissolvent, and the most powerful remedy in this disease. It dissolves the most tenacious substances, and opens all obstructions of the viscera; and yet has no acrimony, and may be safely given in the pleurisy and dropsy. Its dose is from five grains to a scruple and upwards.

When a jaundice is attended with an hæmorrhage, it is always dangerous, because it denotes a most acrimonious and dissolved state of the blood: in which case, attenuants, aloetics, volatiles, and chalybeates, are little better than poison; whereas acids, diluents, demulcents, and mineral waters, are very beneficial. Hemp-seed, boiled in milk till it breaks, is often advantageous, [the dose is 5 ounces twice a-day,] or an emulsion of white poppy seeds and sweet almonds, after moderate bleeding, (if the patent is feverish, and the pulse will allow it) and gentle purging.

Of the Bilious Colic.

A Bilious colic is attended with the following symptoms; a hoarse voice, a cardialgia, a continual loathing of victuals, a vomiting of bilious poraceous matter, hiccup, a feverish heat, inquietude, intense thirst, a bitter taste in the mouth, and the urine little and high-coloured. Hoff. Add to these, a burning, acute, continual pain about the region of the navel, which either seems to bind the belly as it were with a girdle, or is contracted into a point as if the patient was bored through, which sometimes remits, and then grows more violent. In the beginning it is not so much determined to one point, nor is the vomiting so frequent, nor does the body so obstinately withstand the force of cathartics. But as the pain increases, the more it is fixed to a point, the vomiting is more frequent, the body more costive, till at length it terminates in the iliac passion. At this time the pain is so intense as to occasion a singultus, a delirium, coldness in the extremities, and chilling, clammy sweats, which are always a dangerous omen in this disease.

It is distinguished from a fit of the gravel, as the pain in this lies in the kidney, and is extended from thence by the ureter to the testicle; after eating, the colic pain increases, the nephritic abates; evacuations upward or downwards relieve the colic more than a fit of the gravel. The urine in the latter is more clear and thin at first, afterwards there is a sediment, and at length gravel or small stones; whereas in the colic the urine is more thick in the beginning.

Bleed freely in the arm; and after three or four hours exhibit an anodyne, and the next day a gentle cathartic, which may be repeated every other day, to the third time.

Sydenham recommends riding, especially when the cure is only palliated with opiates.

If the disease is caused by a plentiful eating of summer-fruits, the patient should drink posset-drink plentifully, then take an anodyne, and bleed the next day.

Russel observes, that when the colic proceeds from costiveness without a fever, then a pint of sea-water, drank every morning, will cure it. But if the first onset of the disease is neglected, and it proceeds to an inflammation, with a fever, vomiting, and retention of the excrement, and there is reason to be apprehensive of the iliac passion; when black vomiting supervenes, and the fæces are thrown up by the mouth; as also when there is a quick weak pulse, and cold sweats supervene; then the patient will be carried off by a mortification. Sometimes after the rigors, pus will show itself in some place or other, which prevents immediate death; while a purulent tenesmus afflicts the unhappy patient.

Of the Hysteric Colic.

This is a common symptom of the hysteric passion, and is attended with a most violent pain about the pit of the stomach, as also with a vomiting of a greenish humour, and a great sinking of the spirits: After a day or two the pain goes off, but upon the slightest motion or perturbation of the mind it soon returns again.

Neither

Neither bleeding nor cathartics have any place in the cure, for they exaſperate the diſtemper; nay, the moſt gentle clyſters are prejudicial: For this diſeaſe ſeems rather to proceed from a diſorder of the ſpirits, than from a fault of the humours. It will be proper firſt to adviſe the patient to drink upwards of a gallon of poſſet drink, to clear the ſtomach of its impurities, by throwing it up again, that the effects of the paregoric may not be hindered. Afterwards give 25 drops of the thebaic tincture, in an ounce of cinnamon-water. This laſt is to be repeated at due intervals, till the ſymptoms diſappear; that is, the effect of one doſe muſt be known, before another is given. Yet ſometimes, in plethoric bodies, if the ſtrength will permit, it is better to prepare the way, by bleeding and purging, or both, for an anodyne.

Of the Flatulent *or* Wind Colic.

If there is a fixed and tenſive pain in the right or left hypochondrium, or beneath the ſtomach, it is a certain ſign that there is wind or excrements pent up in the flexures of the colon. If the pain is in the ſmall guts, the abdomen will be wonderfully ſwelled and puffed up; and the force of the wind is often ſo great, and it diſtends the ſkin to ſuch a degree, that the pain is exaſperated merely by touching it; nor do there want inſtances of a navel-rupture ariſing therefrom. The pains are very acute, the body extremely coſtive, there is a ſenſe of a very great ſtraightneſs or contraction; and if the ſtomach is inflated, the breathing becomes very difficult, and the eructations are attended with ſome ſmall relief. Afterwards there are cardialgic paſſions, and an ineffectual reaching to vomit.

If the diſorder lies in the flexures of the colon, emollient and diſcutient clyſters will be proper, as alſo carminative and emollient liniments applied to the pained part.

When the body is opened, it will be beneficial to give ſome lenient purge, as manna, cream of tartar, terra foliata tartari, with a ſpoonful or two of oil of ſweet almonds.

While the pain is violent, the infuſion of chamomile flowers and yarrow, in the manner of tea, frequently drank, is a very powerful remedy.

It will be alſo beneficial to apply hot bricks or tiles to the part affected; alſo bags with parched oats and carminative ingredients, as carraway ſeed, juniper and bay berries, with decrepitated ſalt. A clyſter of the ſmoak of tobacco, blown through a pipe into the anus, is reckoned an excellent thing.

When indurated fæces plug up the inteſtinum rectum, ſo that the wind and ſcybals can make no exit, then the anus is to be fomented with emollient decoctions; and ſaline ſuppoſitories, with fat, are to be uſed; alſo ſome ounces of linſeed oil, with an emollient decoction in which venice ſoap has been diſſolved, are to be injected as a clyſter.

Of the Colic *from Fumes of Lead.*

This is a diſeaſe to which all workers in lead are ſubject; and is attended with an intolerable pain in the inteſtines, and a moſt coſtive body: the navel is drawn inward, there is the higheſt inquietude and a contraction of the joints, attended with a nauſea, and a conſtant reaching to vomit. It is apt to terminate in a kind of palſy, or a ſpaſmodic aſthma, and afflicts the patient a long time. It is ſometimes owing to the raſhneſs of medicaſters, in giving preparations of lead in the gonorrhœa and other diſtempers.

There is no better preſervative againſt this diſeaſe, than by taking fat broth in a morning; the cure is to be attempted with oleous clyſters, and a plentiful uſe of oil of ſweet almonds taken by the mouth, with or without a ſolution of manna, by which the deſired end will generally be obtained. For the cure for the pareſis, baths of ſweet water are neceſſary; after which the ſpine of the back muſt be anointed with a liniment made of the fat of a hog, expreſſed oil of nutmegs, ſaffron, and oil of roſemary, which is a ſpeedy and a certain remedy.

This diſeaſe is called mill-reek by the miners at lead-hills in Scotland, which all the inhabitants there are ſubject to; but melters of lead have it with the greateſt violence.

In the ſlighter ſtage of it, there is an uneaſineſs and weight about the ſtomach, particularly near the cartilago enſiformis, and ſometimes it is like a colic in the inteſtines. The ſpittle of the patient is ſweet, and inclining to a bluiſh colour, reſembling that of a perſon who chews lead. The pulſe is lowiſh, and the ſkin is all over cold, with frequent clammy ſweats. The legs become feeble, with a pricking numbneſs; and the whole body is lazy and feeble. Sometimes a ſpontaneous diarrhœa carries off the diſeaſe; but if it continues long, it is very prejudicial. During this ſtage the patient is able to work.

When theſe ſymptoms continue long, and ſpirituous liquors are drunk on an empty ſtomach, or after the working of lead, the ſecond ſtage comes one; and then there is a fixed pain in the ſtomach and guts, eſpecially in the lower part of the belly, extending from one hip-bone to the other, with coſtiveneſs and a gnawing pain. The pulſe then becomes weak, and the ſkin hot. There is likewiſe a giddineſs and a violent pain in the head, which is ſucceeded by an inſenſibility and a delirium of the worſt kind; for they bite their hands and tear their own fleſh. Then their extremities tremble with convulſions; and at length they ſink with an intermitting pulſe, and die of a coma or apoplexy.

If proper medicines are given in the firſt ſtage of the diſeaſe, the patient generally recovers. If it proceeds till the giddineſs comes on, the ſucceſs is doubtful; but after that it almoſt always proves mortal.

Workers in lead ſhould never go to their buſineſs faſting, and their food ought to be oily or fat. A glaſs of ſalad oil, with a little brandy, rum, or other ſpirit, is a good morning's draught; but ſpirits alone ſhould never be taken while at work, nor immediately after it. Phyſick ſhould be taken ſpring and fall, and no man ſhould go into the cold air while hot with labour, and they ſhould change their working-cloaths for others as ſoon as poſſible. Liquid aliment is beſt, ſuch as fat broth with good meat; for low living is bad. They ſhould now and then go a little way out of the tainted air.

If the patient is plethoric, the cure is to be begun with bleeding,

bleeding, and then the *primæ viæ* muſt be cleanſed with a double doſe of emetic wine, or emetic tartar, otherwiſe it will have no effect. They will even bear half a dram of glaſs of antimony in fine powder, with plenty of warm water during the operation. If the vomit works well upwards and downwards, the patient is in a fair way of recovery. Then a milder doſe of ipecacuanha muſt be given with tartar emetic. If the doſe does not work either way, he is generally the worſe for it, and a ſtronger doſe ſhould be given ſoon after. If it vomits, but does not purge, an antimonial cathartic, or jalap and mercury ſhould be exhibited in a larger quantity than ordinary, and then the patient ſhould drink plentifully of warm broth. The vomits and purges ſhould be repeated at proper intervals till the diſeaſe diſappears. If they work too much, an opiate may be given at night, but with caution, for fear of rendering the patient coſtive, which is the worſt thing that can befal him. When purgatives do not operate ſufficiently, emollient, laxative, and anodyne clyſters muſt be injected frequently to empty the guts.

Of the Iliac Passion.

The iliac paſſion is a pain in the ſmall inteſtines, apt to turn to an inflammation, in which their periſtaltic motion is inverted, and their contents, and even the excrements themſelves, are voided by the mouth in vomiting. Nothing will paſs downward, not ſo much as a flatus.

It is preceded with coſtiveneſs, which is ſoon followed with moſt ſharp and violent pains, with an inflammation, diſtenſion, and a tumour of the umbilical region, which feels hard to the touch; the body is ſo bound, that neither wind nor excrements can paſs downward: Soon after, the wind firſt makes its way upward, then comes on a nauſea and a frequent vomiting of a bilious and pituitous matter: The breathing grows difficult, and whatever is eat or drank is ſoon thrown up again; reddiſh fæces, with a ſtinking ſmell, are afterwards forced up by vomiting: This is ſucceeded by loſs of ſtrength, a preternatural heat, a hard and contracted pulſe, with great thirſt; the urine is red, and voided with difficulty. When the caſe becomes deſperate, a hiccup and delirium appear; the nerves are diſtended, the body is all in a cold ſweat, and violent convulſions and fainting fits put an end to the tragedy.

In ſome who have been diſſected, the gut ſeemed to be twiſted; but moſt commonly one part of the gut enters into the other. This diſeaſe may alſo proceed from a rupture either of the ſcrotum or the groin; from poiſons; from any thing that ſtops up the paſſage through the ſmall guts, ſuch as hard dry food, quinces, pears, unripe acerb fruit, when eaten in large quantities; to which drinking little, a ſedentary life, and a melancholy diſpoſition of mind, will greatly contribute. Theſe all tend to harden the fæces. The groſs inteſtines may alſo be plugged up with ſcybals; eſpecially if a perſon, either through ſhame, or for want of conveniency, does not liſten to the calls of nature.

As to the prognoſtics; there is hope of recovery while there is no inflammation, and while clyſters are admitted into the body, and rendered back the ſame way; as alſo while the pain ſhifts from one place to another, and the pain and vomiting are not continual; likewiſe when the diſeaſe proceeds from fæces obſtructing the inteſtines. The hope is ſtill greater, if laxative medicines begin to make their way downward. But if there is an inflammation, which is known from a fever, the vehemence of the pain, a ſuppreſſion of urine, a hard and quick pulſe, an unquenchable thirſt, a toſſing of the body, and extreme debility, with coldneſs of the extreme parts, the caſe is deſperate. A ſudden ceſſation of pain, and abſolute want of ſtrength, with a weak pulſe, fainting fits, and a ſtinking breath, ſhew the inteſtines are mortified.

As to the cure; firſt of all it is neceſſary to bleed in the arm, and afterwards, in an hour or two, exhibit a a powerful clyſter. The ſmoke of tobacco blown into the bowels, through an inverted pipe, is very efficacious: This may be repeated after ſome time, unleſs the effect of the firſt renders it unneceſſary. If the diſeaſe will not yield to this, a pretty ſtrong cathartic is adviſeable.

If the patient cannot retain the cathartic, let him take 25 drops of the thebaic tincture in half an ounce of ſpiritous cinnamon water; and when the vomiting and pain remit, let the cathartic be repeated; if the pain returns, give the anodyne again, and repeat it every fourth or ſixth hour till the inteſtines are eaſy, and the cathartic begins to paſs downwards.

After the pain has been mitigated with anodynes, a cataplaſm ſhould be applied to the hypogaſtric region to ſtop the vomiting and hiccup; which may be compoſed of equal parts of old venice treacle and expreſſed oil of nutmegs, with the addition of oil of mint and camphor. This done, a gentle laxative of manna, cream of tartar, and oil of ſweet almonds, may be given.

When there is an inflammation, nothing is better than ſix or eight grains of purified nitre, and half a grain of camphor mixed with ſome antiſpaſmodic powder, and taken in a convenient vehicle. Outwardly apply a liniment of an ounce of axungia humana, [any other penetrating fat will do as well] and a dram of camphor.

But when other things fail in the cure of the iliac paſſion, recourſe muſt be had to quickſilver, which ſometimes has ſurpriſing effects; half a pound, or a pound at moſt, is ſufficient, with fat broth or oil; and the patient ſhould lie on his right ſide, or walk gently about the room, that its deſcent may be eaſier. But if there is an actual inflammation, the uſe of quickſilver ſhould be forborne; if the patient dies, from what cauſe ſoever, the byſtanders will probably affirm the quickſilver killed him.

There is no manner of danger in the uſe of opiates, to mitigate the pain, provided they are exhibited in the beginning, after bleeding, or before there are any ſigns of a mortification.

Clyſters are generally very advantageous; for they relax the ſpaſms of the groſs inteſtines: and for this purpoſe warm water with ſyrup of marſhmallows will be ſufficient; and if the ſtrength will permit, they ſhould be injected every two hours, from the firſt day of the attack. They likewiſe reſtrain the inverſion of the periſtaltic motion, and ſoften the fæces.

Of

Of Vomiting.

Vomiting is a ſpaſmodic, retrograde motion of the muſcular fibres of the oeſophagus, ſtomach and inteſtines, together with ſtrong convulſions of the abdominal muſcles and diaphragm. Thoſe that are ſlight, create nauſeas; thoſe that are ſtrong, vomiting.

Vomiting generally begins with a nauſea, a tenſion and weight in the epigaſtric region, a bitterneſs in the mouth, anxieties of the præcordia, plenty of thin ſaliva in the mouth, a trembling of the neither lip; to theſe may be added, a dizzineſs of the head, a ſudden dimneſs of ſight, redneſs of the face, a fruitleſs eructation; and then the contents of the ſtomach are diſcharged upwards.

Vomiting is cauſed by exceſſes in eating and drinking; by the acrimony of the aliments; by the tranſlation of the morbific matter of ulcers, the gout, eryſipelas, and other diſeaſes, to the ſtomach; from a looſeneſs or bloody flux too ſuddenly ſtopped; from a congeſtion of blood in the ſtomach, which happens to women in the firſt months of pregnancy, or when there is a ſuppreſſion of the menſes, or bleeding piles; from ſympathy, by tickling or irritating the throat or œſophagus with the finger or a feather; from the colic, iliac paſſion, a rupture, fit of the gravel, worms; from poiſons; from hurts of the brain, ſuch as contuſions, compreſſions, wounds or inflammations of the diaphragm, ſtomach, inteſtines, ſpleen, liver, kidneys, pancreas or meſentery; from an unuſual motion of the ſpirits in a cart, coach, or ſhip; from the idea of ſome nauſeous thing, or which has formerly occaſioned ſickneſs or vomiting; from a regurgitation of bile into the ſtomach.

As to the prognoſtics; a critical vomiting is ſalutary; a ſymptomatic bad; and that which proceeds from a ſubtil cauſtic acrimony, which vellicates the nerves, worſt of all. All violent exceſſive vomiting is bad, as it may occaſion abortions, ruptures, *&c.* Bilious vomiting, eſpecially the green, porraceous, and æruginous, conſiſting of a corroding acid, portends danger of an inflammation; vomiting from worms which gnaw the ſtomach, is generally pernicious; vomiting of dead worms, if at the ſame time the convulſions of the limbs and other grievous ſymptoms ſuddenly ceaſe, ſhews a mortification. All fætid vomiting is a ſign of internal corruption, and therefore bad.

When vomiting proceeds from crapula, late ſuppers, diſturbed digeſtion by riding, and the like, it may be prevented by deep inſpirations often repeated, by which the diaphragm is made to preſs on the ſtomach, and accelerate the diſcharge of it contents; but if an inclination to vomit, from the ſame cauſes, comes on unawares, a pretty ſtrong and often repeated friction of the hypograſtric region with the hand, will prevent it.

Pituitous vomiting, from crudities of the primæ viæ, is beſt cured by a vomit, and eſpecially if there is a troubleſome reaching to vomit; attended with a nauſea and a cardialgia; then having firſt preſcribed neutral ſalts, or ſquills, to incite the phlegm, give warm water mixed with unſalted butter, very plentifully, or powder of ipecacuanha.

Bilious vomiting, which proceeds from a depraved digeſtion, and has its ſeat in the duodenum, is cured by abſorbents and gentle laxatives of manna and rhubarb. When it proceeds from too great a laxity of the biliary ducts, then cortex Peruvianus, cortex eleutheriæ, and bitter tinctures and chalybeates, will be moſt efficacious; if from a coagulum or ſtone in the gall-bladder, mineral waters are more likely to ſucceed.

When vomiting is cauſed by a ſharp matter vellicating the nerves of the ſtomach, proceeding from the gout, or an eryſipelas, beſides giving quieting medicines, it ought to be drove back by diaphoretic powders, with a ſmall addition of camphor. Alſo externally, frictions, pediluvia, and clyſters, are uſeful.

When it proceeds from poiſons, nothing is better at the beginning than drinking large quantities of milk, and fat oily things, to ſheath their acrimony, and bring them up by vomiting.

Vomiting from a ſuppreſſion of the menſes, or from the ſtoppage of the bleeding piles, is cured by abſorbents, by gentle laxatives, by clyſters and ſtrengtheners; and more eſpecially by bleeding or cauſing the flux to return. Emetics, in this caſe, are as bad as poiſon, and either cauſe a vomiting of blood, or a fatal inflammation of the ſtomach.

Morning reachings, cauſed by hard drinking, are cured by abſorbents and anti-acids, and by ſtrengthening the digeſtive faculty, by bitters, candied orange-peel, *&c.*

The immoderate and frequent vomiting of pregnant women requires bleeding in the foot, and reſt both of mind and body.

Of the Vomiting *of* Blood.

Vomiting of blood is generally preceded with a tenſive pricking pain in the left hypochondrium; and the eruption itſelf is almoſt always attended with anxiety of the præcordia, and a compreſſing pain, as alſo a kind of girding on the ſame ſide. It is frequently attended with fainting fits, eſpecially if the blood has an ill ſmell, or is corrupted.

The ſeat of this diſeaſe is in the ſtomach, though the ſpleen ſometimes has a ſhare in its production.

Perſons more ſubject to it are the lean and ſlender; women irregular in their menſes, and who have been haſtily cured of intermitting fevers, which has brought on a ſuppreſſion of the menſes, and then have taken hot forcing emmenagogues; as alſo women about the time their menſes leave them; likewiſe plethoric women in the time of pregnancy, and hard labour; and men of a weak conſtitution, ſubject to the bleeding piles, which either ceaſe to flow, or flow in too ſmall a quantity.

The danger which attends this diſeaſe, is not the ſame in all, though no hæmorrhage is more dangerous than this. If there is no fever, and if it proceeds from ſuppreſſed evacuations, cauſed by a plethora, the caſe is not ſo deſperate. On the contrary, if there is a fever; if the blood is corrupted, ſtinking, and black; if it proceeds from a large, diſeaſed ſpleen, or an indurated liver, attended with ſwooning; there is no hope of recovery left. It is ſtill worſe, when the ſtools are black; then the ſeat of the diſeaſe is in the ilium, from a rupture of the meſaraic veſſels.

In the paroxyſm, if the patient is plethoric, bleed according to his age and ſtrength.

When

When there is an orgaſm in the blood, and the pulſe is impetuous and ſtrong,

Take a pound of water, a dram of nitre, and half an ounce of ſyrup of wild poppies.

This, taken ſucceſſively and temperately, will be very efficacious in perfecting a cure.

When the region of the præcordia, eſpecially on the left ſide, is afflicted with pricking and vellicating pains, and ſpaſmodic ſtrictures, together with heat and thirſt, emulſions will be proper. Theſe muſt be made with the four cold ſeeds, and white poppy ſeed; to which muſt be added a little nitre, and a proper quantity of diacodium.

Likewiſe, in order to relax the ſpaſmodic ſtrictures of the inteſtines, and to divert the flux of the humours from the part affected, emollient clyſters, frequently injected, will be proper, with a gentle ſtimulus, and the addition of nitre.

Outwardly, to relax the ſpaſms and ſtrengthen the ſtomach, nothing is better than the oil of camphor; which is made by diſſolving a dram of camphor in an ounce of oil of ſweet almonds, and then by adding twenty drops of oil of rhodium. Let the region of the præcordia and the left hypochondrium be anointed with this oil; and afterwards lay a bag on the part affected, filled with camomile and elder-flowers, with mint and wormwood, boiled in vinegar of roſes or red wine pretty hot.

If blood is thrown up in great quantity, with loſs of ſtrength, ligatures made upon the joints may be ſerviceable, as alſo putting the legs and arms in cold water.

When the paroxyſm is off, half a dram of rhubarb will be highly beneficial, either with or without teſtaceous powders; or twelve grains of compound powder of amber, with half a grain of camphor taken twice a-week, at night going to bed, in a draught of ſpring water. Rhubarb is a kind of a ſpecific in opening obſtructions. The patient, inſtead of tea, may drink a decoction of yarrow, liquorice, and fennel ſeeds. The common drink may be ſpring water, in which iron has been quenched, or acidulated whey.

If this diſeaſe proceeds from a ſuppreſſion of the menſes; bleed in the foot, and give clyſters prepared of mugwort, pennyroyal, wall-flowers, bay and juniper-berries, pretty frequently.

If it is cauſed by ſharp acid liquors corroding the veſſels of the ſtomach, then teſtaceous alkaline powders are proper; and ſtarch boiled in milk will heal the veſſels.

Opiates muſt be ſhunned in theſe caſes, becauſe they bring on great weakneſs and loſs of ſtrength, to the great detriment of the patient. Likewiſe all ſtyptics, aſtringents, and vitriolic medicines, muſt be ſtudiouſly avoided: theſe, indeed, will ſtop the eruption of blood; but then it will ſtagnate and putrify in the veſſels, with danger of an inflammation and mortification; or at leaſt, if the patient is cachectic, it will haſten a dropſy.

Of a Diarrhoea, *or* Looseness.

A Diarrhoea is a frequent and copious evacuation of liquid excrements by ſtool; and may proceed from aliments, or humours of various kinds, derived from different parts into the inteſtines.

The cauſe is a ſtimulus which irritates the viſcera, occaſioning the expulſion of their fluids; and may therefore proceed from the veſſels of the liver, pancreas, meſentery, and inteſtines; when at the ſame time the mouths of the meſenteric veins and the lacteals are obſtructed. Or there may be an extraordinary laxity of the inteſtinal fibres; or, laſtly it may ariſe from a ſtoppage of other excretions. It is frequently attended with gripings. The patient is weak, makes but little urine, has a depreſſed pulſe, a depraved appetite, and is ſometimes feveriſh.

In a diarrhœa ariſing from ſharp fermenting juices in the *primæ viæ*, which accelerate the periſtaltic motion of the inteſtines, the firſt indication is to diſcharge the ſtimulating matter; which may be effected by a doſe or two of rhubarb.

At night the patient may take fifteen drops of the thebaic tincture, in two or three ſpoonfuls of ſimple cinnamon water. The rhubarb is to be repeated till the looſeneſs abates, which is generally after the ſecond doſe.

If there is a ſaburra of ill-concocted matter in the ſtomach, a vomit will be neceſſary of ipecacuanha, [or an ounce of its wine]

If the diarrhœa continues to be violent, it will be proper to mix aſtringents with the rhubarb.

If the diarrhœa proceeds from ſuppreſſed perſpiration; and if the ſtools are thin, and the patient feveriſh; firſt bleed, then give an emetic, afterwards a purge of rhubarb, and laſt of all aſtringents.

But the beſt and ſafeſt aſtringent of all is logwood, given in decoction.

A bilious diarrhœa ought not to be too ſuddenly ſtopped, but the humours are to be corrected gradually; for which purpoſe, a ſcruple of rhubarb ſlightly toaſted, with a few grains of nitre, is very uſeful. Likewiſe half a dram of the expreſſed oil of nutmegs, either alone or mixed with a grain of opium, and given in broth, is very efficacious. The humours are likewiſe corrected with thin emulſions of almonds and white poppy-ſeeds, with the addition of diacodium.

When a diarrhœa is very obſtinate, after toaſted rhubarb has been given for ſome days, preſcribe a ſweat with a dram of new venice treacle, and twelve grains of burnt hartſhorn, calx antimon. and purified nitre.

An habitual diarrhœa is greately relieved by wearing a flannel ſhirt, and keeping the body warm.

In Vol. I. of the *London Medical Obſervations and Inquiries*, Dr Pye proves, by a long enumeration of inſtances, that in all looſeneſſes where emetics are adviſeable in every age and ſex, though the patient be in the weakeſt circumſtances, ipecacuanha, from half a grain, to four or ſix grains, may be given with the utmoſt ſafety, and will ſeldom fail of anſwering the intention of the preſcriber; and adds, that for many years he had experienced the great efficacy of it, in curing or aſſiſting in the cure of diarrhœas in children, when adminiſtered in clyſters.

Of

Of the Cholera Morbus, *or* Vomiting *and* Looseness.

A Cholera, or vomiting and looſeneſs, is a ſudden violent purging upwards and dnwnwards, proceeding from a convulſive contraction of the ſtomach and inteſtines, cauſed by ſharp cauſtic matter of various kinds.

It generally begins in Auguſt, and ſeldom reaches the firſt weeks of September, unleſs it be a ſpurious kind which ariſes from exceſs.

It diſcovers itſelf by enormous vomiting, and a voiding of vitiated humours by ſtool. There is a violent pain, inflation and diſtention of the belly and inteſtines, as alſo a cardialgia and thirſt; the pulſe is quick and frequent, ſmall and unequal; there are heat and anxiety, a moſt troubleſome nauſea, ſweating, a contraction of the legs and arms, fainting, coldneſs of the extreme parts, and the like, which kill the patient in twenty-four hours.

Though this diſeaſe is generally preceded with acid, nidorous belchings, pungent and cardialgic pains in the ſtomach and inteſtines; yet ſoon after, all of a ſudden, and at the ſame inſtant, the vomiting and looſeneſs make their attack. The remains of the laſt meal are voided firſt; aftewards bilious humours, mixed more or leſs with mucus; then thoſe that are yellow, then eruginous, then black, often exceeding acid, and almoſt corroſive, together with frequent eructations and wind, and ſometimes blood itſelf. The returns of the evacuations are very frequent. Beſides, there are moſt acute, wringing, griping, gnawing, biting pains, with inflation and rumbling of the inteſtines, chiefly above the navel, and moſt racking cardialgias. As the diſeaſe increaſes, the thirſt becomes great, the extreme parts grow cold: there is a palpitation of the heart, and then hiccups; the urine ſtops, and the body is covered with a cold ſweat. It is common for the patient to ſwoon away, and to fall into terrible convulſions.

There is no diſeaſe, except the plague and peſtilential fevers, that kills ſooner than this, eſpecially if it attacks old perſons, or children, or ſuch as are weakened with diſeaſes. The more cauſtic the matter is which is voided, the more intenſe are the thirſt and heat, and the more certain the danger. If it be black bile, and mixed with black blood, death is inevitable. The caſe is as bad when there are faintings, hiccups, convulſions, coldneſs of the extreme parts, and cold ſweats. Nor is any thing better to be expected from a ſtoppage of the evacuations, while the reſt of the ſymptoms continue. But if the vomiting ceaſes, and the patient ſleeps ſoon after, or the diſeaſe is protracted beyond the ſeventh day, he may recover; if he begins to break wind downward, it is a good ſign.

This diſeaſe requires the moſt ſpeedy aſſiſtance, and therefore the phyſician cannot be called too ſoon. The indications of cure are, 1. To correct and ſheath the morbific matter, and to fit it for evacuation. 2. To appeaſe the irregular ſpaſmodic motions. 3. To ſtrengthen the nervous parts which the diſeaſe has weakened

Boil a large chicken in three gallons of water, that ſo there may be ſcarce any taſte of the fleſh and give the patient a large quantity of it to drink; or, for want of it, warm poſſet-drink; and alſo repeated clyſters of the ſame liquor; now and then an ounce of ſyrup of violets may be added to the draught or clyſter. Theſe operations may be compleated in three or four hours, and then a paregoric will crown the whole.

But if the phyſician is not called in time, and the patient has been exhauſted with vomiting and purging for many hours, and the extreme parts begin to grow cold, then immediate recourſe muſt be had to liquid laudanum in a large doſe. And when the ſymptoms ceaſe, it is to be repeated morning and evening, till the patient's ſtrength returns.

Neither cathartics nor emetics, properly ſpeaking, are of uſe in this diſeaſe; but the vomiting may be promoted by drinking a large quantity of warm water mixed with freſh butter or oil; and the purging by oily and emollient clyſters. Or the patient may drink ſmall chicken-broth. Whey is of great uſe to quench the thirſt; to which may be added, the abſorbent and teſtaceous powders.

If the patient is not too much exhauſted, make him drink plentifully of warm water three or four times, to dilute and blunt the acrimony of the humours, and to bring them up by vomit: Then he muſt take as freely of a decoction of oat bread, baked without leaven or yeaſt, carefully toaſted, without burning, as brown as coffee; which decoction ought to be of the colour of weak coffee. This is grateful to the ſtomach, and is ſeldom brought up again.

When the patient is much exhauſted with evacuations upwards and downwards, give him a large draught of the decoction; and, when the nauſea is pretty well ſettled, two thirds of a grain of opium, more or leſs, according to the ſtrength and age of the patient.

But if the patient is convulſed, the extreme parts cold, and the pulſe weak and intermitting, twenty-five drops of liquid laudanum, in an ounce of ſtrong cinnamon water, is more proper; and afterwards a draught of any wine in an equal quantity of the decoction. After this, he may take the decoction to quench his thirſt, and a little wine now and then as a cordial.

To prevent a relapſe, repeat the opiate in a moderate quantity for ſome days, morning and evening; and care muſt be taken not to overload the ſtomach, or to eat any thing but what is of good nouriſhment, eaſy to digeſt, and grateful to the ſtomach.

Of the Dysentery, *or* Bloody-Flux.

A Dysentery begins with ſhivering and ſhaking, ſucceeded by heat of the whole body; which are followed by griping of the guts, and ſoon after by frequent voiding of ſlimy ſtools, attended with violent pain, and a moſt troubleſome preſſing down or ſeeming deſcent of all the bowels, and this every time the patient has a ſtool. In proceſs of time the ſtools are mixt with blood, and afterwards pure blood is only evacuated, and the inteſtines are affected with an incurable gangrene. Yet ſometimes there has been no blood through the whole progreſs of the diſeaſe.

If the patient is in the flower of his age, or has been heated with cordials, he is very feveriſh, his tongue is

whitiſh,

whitish, and beset with a thick mucus; sometimes it is black and dry; he becomes excessively weak, and is quite destitute of spirits; aphthæ or a thrush appear in his mouth and throat, especially if the evacuation of the morbific matter has been preposterously prevented by astringents, and the fomes of the disease has not been expelled by cathartics. Sometimes, when a fever is absent, the gripes lead the van, and the rest of the symptoms follow.

Those whose stomachs are loaded with much indigested matter, are troubled with a nausea, reachings and vomiting; many have an intolerable heartburn and anxiety of the præcordia. All are afflicted with a perpetual desire of going to stool, and such a violent tenesmus as is not seldom attended with a procidentia ani.

In some, the extreme parts are cold, while the inward seem to burn, and a perpetual sense of heat and a pulsation torture the intestines. To these succeed hiccups, cold sweats, a pale countenance, wasting of the body, inflammations, and aphthæ of the fauces. At last, all pain ceases at once, the thirst vanishes, the stools come away insensibly with a cadaverous stench, the pulse becomes slender, and death is at hand. This disease is often contagious.

Prognostics. Dysenteries are dangerous to pregnant women, to old men, and to boys. There is commonly little hope when it attacks the scorbutic, the consumptive, and the cachectic; those that are weak and afflicted in mind, or troubled with worms. When it begins with vomiting, succeeded with hiccups, there is danger of an inflammation of the stomach. Nor is the case better when the stools are green, black, mixed with caruncles, and of a noisome stench. It is a fatal omen when clysters are immediately returned, or the anus so obstinately closed that nothing can be injected; for it is a sign of a palsy of the rectum. When the pulse is weak, the extreme parts cold, and the inward burn, or are without sense, nothing good can be expected. When swallowing is attended with a murmuring noise, it shews the approach of a delirium, an inflammation of the fauces, aphthæ, or a palsy of the whole œsophagus. It is necessary to know, that this disease sometimes quickly terminates, especially if there be a malignant fever, and then it kills in seven, nine, or fourteen days; sometimes it does not cease till the fortieth or upwards; when it continues a long while, it either kills the patient, or brings on a dropsy, a lientery, the cœliac passion, a tabes or hectic, which are incurable.

The common method of curing a dysentery, is first to bleed, then to vomit with ipecacuanha, afterwards to purge with rhubarb, and last of all to give astringents. Hoffman directs a scruple or half a dram of the ipecacuanha, with a testaceous powder, drinking a large quantity of warm water after it. This vomit is sometimes to be repeated. It is the modern practice, after the first vomit, to give two or three grains of ipecacuanha every eight or ten hours, in a bolus, with diascordium, or the like, with some proper julep. Hoffman would have the rhubarb given in substance, that is, half a dram in powder; Dener gives it twelve hours after the vomit, repeating it in small doses.

Mr Ray says, that the fungous substance between the lobes of a walnut, dried and powdered, and given in a moderate quantity in wine, cured the English army of a terrible dysentery in Ireland, when all other remedies failed.

Jussieu says, a thick yellow bark, called simaruba, has been found successful in the cure of a dysentery. The dose is a third part of a quart of a decoction made with two drams of the bark. And Cramer assures us, we may depend upon the same effect from the decoction of common millet-seed, called St Ambrose's syrup, which Luther looked upon as a cure for the colic. Count Argenton took it first by his advice, merely to quench his thirst, in the manner of tea, by which means he got rid of his thirst and dysentery in twelve hours time.

Another specific is the vitrium antimonii ceratum, which has been in use for some time, but was kept a secret till it was communicated by Dr Young of Edinburgh to the public.

The manner of preparing it is as follows:

> Take of glass of antimony in powder, one ounce; bees-wax, one dram: melt the wax in an iron ladle, then add the powder: set them on a slow fire without flame, for the space of half an hour, continually stirring them with a spatula; then take it from the fire; pour it upon a piece of clean white paper, powder it, and keep it for use.

The ordinary dose for an adult is ten or twelve grains; but for greater safety begin with six.

Never give opiates in the beginning, especially where there is great sickness; because, though opiates give relief to some, yet at other times both the sickness and purging increase the following day.

Bontius, in his account of the diseases of the East-Indies, affirms, that extract of saffron is a specific in the dysentery of those parts, even though it should proceed from poison.

Of the Head-Ach.

The head-ach is a most troublesome sensation in the nervous membranes of the head, produced by various causes, and attended with different symptoms, according to its different degrees, and the place where it is seated.

The most common seat of this disease is the pericranium; a membrane which invests the skull, coheres with the muscles next the skull, and is joined to the dura mater by some fibres which pass through the sutures. It is a thin nervous membrane of exquisite sense. It may likewise be in the skin that covers the skull, and in the dura matter. This last but seldom happens; but when it does, it is very dangerous. There may likewise be a very acute pain in the thin membrane which covers the sinus of the os frontis.

If the head-ach be slight, and affects a particular part of the head, it is called cephalalgia; if the whole, cephalæa; if one side only, hemicrania; if there is a fixed pain on the forehead, which may be covered with the end of the thumb, it is called clavus hystericus.

The general cause of the head-ach is a hindrance of the free circulation of the blood through the vessels of the head.

When

When the blood ruſhes with impetuoſity, and in too great plenty into the membranes, which may happen to the plethoric, to thoſe whoſe uſual bleeding at the noſe is ſuppreſſed, and to young perſons, there is a pain in the whole head, which becomes hot, ſwells, aches, and looks red; the veſſels ſwell, and there is a ſtrong pulſation in thoſe of the neck and temples. The noſtrils are dry and parched, there is a burning heat and drought in the fauces.

When the veſſels of the head are ſtuffed with a mucous ſerum from a ſtoppage of the running of the noſe, then there is a heavy, obtuſe, preſſing pain, chiefly in the fore-part of the head, in which there ſeems to be ſuch a weight, that the patient can ſcarce hold it up. Sometimes the ſkin is ſo ſwelled, that it will pit.

Sometimes it happens from the ſerous, ſharp, cauſtic matter of the French diſeaſe, which infects the pericranium, and often cauſes a caries in the ſkull.

Sometimes it may proceed from matter of a ſaline cauſtic nature, driven back from the external parts; as, in the gout, itch, eryſipelas of the head, gutta roſacea; in the ſmall-pox and meaſles, before the morbid matter is expelled to the outward ſkin, or, which is worſe, when it is driven back. In theſe caſes, when a ſmall quantity of cauſtic matter cauſes the pain, it rather proceeds from a violent ſtricture of the membranes than from their diſtenſion.

There is likewiſe a moſt violent, fixed, conſtant, and almoſt intolerable head-ach, which brings on a debility both of body and mind, hinders ſleep, diſturbs digeſtion, deſtroys the appetite, cauſes a vertigo, dimneſs of ſight, blindneſs, a noiſe in the ears, convulſions, and the epilepſy; and, by conſent of the other nervous parts of the body, produces vomiting, coſtiveneſs, coldneſs of the extreme parts, and the countenance of a dying perſon.

Sometimes the head-ach is ſymptomatic, and attends upon continual and intermitting fevers, and eſpecially the quartan, irregular flowing of the menſes, the hypochondriac paſſion, and the like. A hemicrania generally proceeds from a fault in the ſtomach, from crudities or indigeſtion, and commonly appears when digeſtion is performed.

The head-ach is not always without danger: If the cauſe of the pain is within the ſkull, and is violent and conſtant, attended with a fever and want of ſleep, it portends a phrenſy. If it ſuddenly attacks the hypochondriac; or thoſe that are prone to melancholy, eſpecially if preceded by a violent paſſion of the mind, and deprives the patient of ſleep and appetite, and is joined to difficulty of hearing, and an internal pulſation of the veſſels, and all theſe without a fever, it preſages madneſs. But when the pain in the head is ſudden and very acute, with a noiſe in the ears, difficult walking, a weakneſs of the knees, an impediment and ſlowneſs in ſpeech, it is the forerunner of an apoplexy or a palſy; in which laſt the pain is greater on the well ſide than the diſeaſed, becauſe the latter has loſt all ſenſation.

The curative indications are, 1. To divert the impetus of the blood and humours from the head, and to diſcuſs them by ſuitable remedies. 2. To relax the ſpaſtic ſtrictures of the membranes of the head, the cauſe of which is a ſharp cauſtic matter, that the fluids may have a freer circulation. 3. To correct the peccant matter, and evacuate it gently through the moſt convenient emunctories. 4. To prevent a return by ſtrengthening the whole nervous ſyſtem by proper remedies, and eſpecially by an accurate diet and a ſuitable regimen.

When the blood ruſhes to the head in too great quantity, bleeding is neceſſary, more particularly under the tongue, in the forehead, in the jugulars, or by leeches behind the ears. If the body abounds with too much blood, it will be beſt to bleed in the ancle firſt, and the next day, or the day after, in a vein about the head. But firſt of all cleanſe the body by any emollient clyſter, or by giving an infuſion of rhubarb and manna, with cream of tartar.

To reſtrain the orgaſm of the blood, it will be proper to give a diaphoretic and abſorbent mixture, with diaphoretic antimony, purified nitre, burnt hartſhorn, and diacodium, diluted with a ſufficient quantity of ſuitable ſimple diſtilled waters.

When there is an intenſe pain remaining fixed in one place, lying pretty deep in the membranes, the herb ranunculus, uſed as a veſicatory, has a wonderful efficacy. It is the upright meadow-crawfoot, with leaves like the anemone, and, if taſted, is extremely biting to the tongue. The leaves muſt be bruiſed in a marble mortar, and the part, if hairy, ſhaved; then a ſticking plaiſter is to be laid on it, with a hole about the bigneſs of a ſilver penny, and the leaves over that; juſt in the ſame manner as a cauſtic. This is an experiment of Cheſnau's; and like ſucceſs may be had by mixing equal parts of volatile ſal ammoniac and powder of muſtard-ſeed, laying it on the part in the ſame manner.

When it is cauſed by a ſuppreſſion of a coryza or running of the noſe, a ſmelling-bottle of volatile ſalts ſhould be held frequently thereto. Or the patient may take herb-ſnuff, with the addition made of flowers of benjamin and powder of cloves.

When the head-ach ariſes from a corrupted maſs of blood and an impure ſerum, as in the ſcurvy and lues venerea; a decoction of the woods with crude antimony may be ſerviceable, after evacuations, faſting a day now and then, with labour and exerciſe, will likewiſe be uſeful; as alſo a ſudorific.

A hemicrania, eſpecially a periodical one, is generally owing to a foulneſs in the ſtomach and *primæ viæ*; for which gentle emetics will be beneficial, as alſo purgatives to derive the humours from the head; afterwards ſtomachics. If it proceeds from profuſe evacuations of the menſes or hæmorrhoids, thoſe fluxes muſt be reduced within bounds.

If the head-ach is ſo intolerable as to endanger the patient's life, or is attended with continual watching, fainting-fits, a fever, an inflammation, or a delirium, recourſe muſt be immediately had to opiates with native cinnabar, after a clyſter has been firſt given.

When there is an intolerable pain in the ſinuſes of the noſe, or the bony ſinuſes of the head, produced by an extravaſation of ſome fluid, the only cure is ſcarification of the noſtrils, or cauſing the noſe to bleed with a ſtraw ſuddenly thruſt therein.

If there is an extravaſation under the pericranium, and the humour is ſo ſharp as to begin to render the bone carious, then recourſe muſt be had to an inciſion, as in a whitloe.

In ſome kinds of head-ach, it will be proper to open the frontal vein.

When the patient's ſtrength will not bear the loſs of blood, temperate pediluvia will be beneficial, and ſtrong frictions of the feet with a coarſe cloath; as alſo cataplaſms of horſe-radiſh and ſalt laid thereto.

Of the Heart-Burn.

The heart-burn is a pain more or leſs violent about the pit of the ſtomach, with anxiety, a nauſea, and often a reaching, or actual vomiting.

The cauſes are, vitiated humours in the ſtomach, vellicating and gnawing the ſtomach itſelf, or its left orifice, which the ancients call cardia. The ſtomach thus irritated, a painful ſenſation is excited, and ſpaſmodic conſtrictions, which occaſion a nauſea and vomiting. But common heart-burns are generally without vomiting. The heart-burn may alſo proceed from wind and indigeſtion, and now and then from worms; but more frequently from congeſtions of blood about the ſtomach, which may happen to thoſe who are full of blood, but more eſpecially to the hypochondriac and hyſteric, when vomiting of blood not ſeldom enſues.

The cure of a common heart-burn from indigeſtion and the acrimony of the contents of the ſtomach, which chiefly happens in a morning with wind, may be performed only by drinking tea or coffee, or a decoction of camomile flowers; as alſo by taking bitters, or a dram of powder of orange-peel, or camomile flowers, in a ſmall glaſs of wine made pretty hot, and ſweetened with ſugar. The teſtaceous and abſorbent powders are excellent in this caſe; ſuch as the tabellæ cardialgiæ, or lozenges for the heart-burn, which may be carried in the pocket and taken at pleaſure; about a dram is ſufficient for a doſe.

When it ariſes from a crapula, gentle emetics will be uſeful. If the patient begins to vomit without them, large draughts of warm water will aſſiſt to cleanſe the ſtomach; or carduus benedictus tea taken freely.

If the cardialgia proceeds from a congeſtion of blood, and the painful ſpaſms then ariſing, bleeding will be convenient, and emetics hurtful. If the menſes are ſtopped, bleed in the foot.

Nor muſt anodyne and emollient clyſters be omitted. It will likewiſe be proper to apply a bladder filled with a decoction of chamomile, pretty hot, to the ſtomach. After recovery, riding will be convenient to regain the loſt ſtrength.

If worms are the cauſe of the heart-burn, no acrid anthelmintics muſt be given, but warm milk mixed with oil of ſweet almonds, which, if drank in ſufficient quantity, may cauſe them to be thrown up.

Of the Tooth-Ach.

The tooth-ach is cauſed by impure ſerum, which corrodes and rends the ligaments and nerveo-glandulous coats, by which the roots of the teeth are kept firm in their ſockets, and wherewith they are inveſted.

It is a kind of rheumatic diſorder; for we have often obſerved that pains of the joints and ſhoulders have ſhifted to the ſide of the head, and have invaded the teeth and gums with violent pain. On the contrary, pains of the head and teeth have fallen into the arms and ſhoulders.

The ſeat of the tooth-ach may alſo be in the cavity or internal parts of the teeth themſelves, that is, in the little veſicular cord compoſed of the nervous membrane, an artery, a vein, and a lymphatic veſſel, which may either be diſtended by ſtagnating ſerum, or be affected with a ſpaſtic conſtriction, eſpecially if the tooth is carious, and the caries reaches the ſaid cord.

As in the gout there is a pain, redneſs, a tumour, and a little fever, ſo they ſometimes appear with the tooth-ach. There is alſo frequently a copious diſcharge of ſaliva, which proceeds from a painful ſpaſm, which conſtringes the lymphatic and venous veſſels.

As the rheumatiſm appears in temperate, and a ſudden change of weather; ſo it is with the tooth-ach, eſpecially when the weather is hot and cold by fits.

The whole intention of cure conſiſts in deriving and diverting the impure ſcorbutic ſerum from the head, and then carrying it off through proper emunctories; and afwards in ſtrengthening the parts.

This is to be done by ſaline, emollient, purgative clyſters; by warm pediluvia of rain-water and wheat bran, with venice ſoap, and uſed juſt before bed-time; by laxatives of manna and caſſia diſſolved in whey or aſſes-milk or mineral waters. If the patient is plethoric or full of blood, bleeding in the foot will derive the humours from the head.

Sudorific remedies are alſo proper, but more eſpecially an electuary made of rob of elder-berries, burnt hart's-horn, diaphoretic antinomy, and a few grains of nitre, which cannot be too highly praiſed. Or an ounce of the rob may be taken in broth to promote a diaphoreſis; and it may be uſed externally, diſſolved in beer, in the manner of a gargle, which will yield immediate relief to the patient.

Outwardly may be applied bags, filled with paregoric and emollient ſpecies, ſuch as elder, melilot, and camomile flowers, bay and juniper-berries, carraway and millet ſeeds, and decrepitated ſalt. They muſt be laid on warm, and are very ſafe.

A drop or two of oil of cloves, or box, applied to a carious tooth with cotton, are medicines not to be deſpiſed. Camphorated ſpirit of wine mixed with ſaffron, caſtor, and opium made into a liniment, and laid to the gums and hollow teeth, often gives the patient eaſe.

When the tooth-ach proceeds from a rotten, hollow tooth, it will be beſt to burn the little nervous cord, which is the ſeat of the pain, with an actual cautery; and then the cavity may be filled up with a mixture of wax and maſtich.

If this cannot, or is not permitted to be done, the only remedy left is to have the tooth drawn. But if the patient is plethoric, it will be ſafeſt to bleed firſt, for fear of a fatal hæmorrhage.

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A ſmall pill, made of equal quantities of camphor and opium, and put into a hollow tooth, is often beneficial. Some greatly recommend a ſmall plaſter of tacamahac laid on the ſide of the face, upon the articulation of the jaw-bone, or upon the temples.

But above all, the root of iris lutæa, or the yellow water flower-de luce, rubbed upon the tooth that is painful, or the root itſelf chewed in the mouth, in an inſtant, as if by a charm, drives away the pains of the teeth, ariſing from what cauſe ſoever.

It is now become a practice, eſpecially in France, upon drawing a ſound tooth, to replace it in its ſocket; where, with proper precautions, it will faſten again. Muſgrave is the firſt who recommends this practice. After the extraction of the tooth, he adviſes a gargle of honey, mixed with the juice of the herb mercury, common ſalt, and ſpring-water, and then to put it in its former place; and adds, it will become more uſeful than before.

The French operators have improved this hint; and when the tooth is rotten, or otherwiſe unfit to be replaced, they put another ſound human tooth in the room of it, when it can be had; otherwiſe one of any other animal that is of a ſize ſuitable for the purpoſe.

De la Motte, in the tooth-ach, adviſes to make a ſmall round ſticking plaiſter, about the bigneſs of a ſilver groat, and to put a flat bit of opium in the middle of it, of a ſize not to prevent the adheſion of the other. This is to be laid on the artery near the cavity of the ear, where the pulſation is moſt ſenſible. He affirms, there are few caſes that this will not relieve.

Of the Ear-Ach.

The ear-ach is a grievous pain in the meatus auditorius, or cavity of the ears, proceeding from a ſharp extravaſated ſerum affecting the nervous membrane which lines the meatus auditorius.

This diſorder frequently attacks thoſe who are ſubject to rheumatic and ſerous defluxions; or it may ariſe from a ſudden ſuppreſſion of ſweat, or from the head being expoſed to cold winds when it is moiſt with ſweating. The cauſe is often an inflammation or ulcer of the ear, attended with a remarkable heat, and tenſive beating pain, a redneſs, a fever, and even ſometimes a delirium. Sometimes it is excited by worms; and then there is a wandering, cutting, gnawing pain.

The ear-ach is ſometimes ſo violent as to cauſe a delirium, with the higheſt inquietude and anxiety, inſomuch that the patients often fall into an epilepſy through the violence of the pain.

The ear-ach is ſometimes a ſymptom of acute fevers, when the morbific matter is tranſlated to the ear, as in the Hungaric diſeaſe, when deafneſs or difficulty of hearing ariſes. When it happens in the declenſion of a fever, it is a certain ſign of recovery; but then the diſorder is in the internal part of the ear, and the auditory nerve. When the matter is tranſlated to the external part, then the ear-ach ariſes; which, unleſs ſpeedily appeaſed, may deprive the patient of life. Thoſe who have the ear-ach from a fall, and a ſanious matter runs out of the ear, are all carried off.

The principal ſcope is to eaſe the pain, which may be done with nitrous and cinnabarine powders, and with emulſions of the greater cold ſeeds; but if theſe are ineffectual, we muſt have recourſe to opiates, ſuch as the ſtorax pills, or the thebaic tincture.

Outwardly, lay a plaſter to the temple of the affected ſide, compoſed of maſtich, galbanum, ſaffron, expreſſed oil of nutmegs, and opium. Afterwards let the ear be held over the vapour of milk, with the fragrant and emollient ſpices. Alſo, fill a hog's bladder with the decoction of milk of flowers of mallows, mullein, elder, mellilot, camomile, linſeed, and a little ſaffron, and apply it to the part affected. Likewiſe the ſmoke of tobacco blown into the ear, and an infuſion of millepedes in ſalad oil, are thought be of great efficacy when the inflammation is cauſed by a ſharp ſerum.

Camphorated ſpirit of wine, eſpecially with ſaffron, made pretty hot, and a few drops of it put into the ear with cotton-wool, is a great reſolvent; it ſhould alſo be rubbed into the parts behind the ear. Or oil of almonds with camphor may be uſed in the ſame manner; laying over either of them a hot bag filled with reſolvent herbs, as ſage, penny-royal, wild thyme, wild marjoram, camomile flowers, Florentine orris, fennel and caraway ſeeds, with camphor. When the patient is plethoric, bleeding is convenient.

The moſt violent ear-ach, from taking cold, may be infallibly cured, in a very ſhort time, by applying the ear cloſe to the mouth of a bellied jug, filled with a hot ſtrong decoction of camomile-flowers.

When the inflammation will not reſolve, a poultice of white bread and milk, or onions roaſted under the cinders, or the like, may be often laid hot to the part affected, till it breaks, or the abſceſs is evident to the eye.

If the ear-ach is cauſed by any thing got into the ear, it will be beſt to relax the membrances by oil of almonds, and then cauſe the patient to ſneeze, which forces it out.

When there is a copious flux from the ear after an abſceſs, the humours muſt be diverted by gentle laxatives, bliſters, cupping, and pediluvia, if the patient is an adult. It ſhould not be ſuddenly ſtopped by externals.

Of the Stone *in the* Gall-Bladder.

The ſigns of it are a fixed pain in the right hypochondrium in the region of the liver, which is conſtant, preſſing, heavy, and ſometimes acute; often attended with an ill colour in the face. The pain ſometimes reaches to the epigaſtric region and the pit of the ſtomach. And the exacerbation is ſo great, at certain intervals, that the gripes and torture affect the whole cavity of the abdomen; joined with inappetence, a nauſea, reaching to vomit, anxiety of the præcordia, cardialgic anguiſh, coſtiveneſs. At length, if the diſeaſe is obſtinate, and will not yield to the beſt remedies, the jaundice ſupervenes. Some of theſe patients are continually afflicted with gripes, and live in this condition for many years, and generally die of the dropſy. Some feel a heavy, obtuſe, deep, obſtinate pain, with a tenſe weight, when the gall-bladder is greatly diſtended with ſmall ſoft ſtones.

If the pain continues very intenſe and ſharp, it draws the whole ſyſtem of the nervous parts into conſent, cauſing ſpaſtic ſtrictures, not only of the adjacent parts, but alſo

of the remote; diſtentions of the arms and joints, epileptic convulſions, and likewiſe a fever with a hard quick pulſe, which ſhews a large rough ſtone is firmly fixed in the biliary ducts, that will ſoon hurry the patient out of the world.

But nothing is a more certain ſign that theſe terrible diſorders proceed from gall-ſtones, than when they are voided with the excrements; and then all the ſymptoms ceaſe at once, except the jaundice, which diſappears by little and little, or is eaſily cured.

If the ſtones are ſoft, and of a light colour; or tophaceous and like mortar of plaſter, they moſt probably proceed from the hepatic ducts: If they are rough, hard, angular, and of a deep colour, they proceed from the gall-bladder, eſpecially if attended with moſt cruel ſymptoms in their paſſage through that ſlender canal. However, ſtones have been found in the gall bladder after death, which have produced no extraordinary ſymptoms.

There are two times of the diſeaſe, which require two different methods of treatment; in the fit, and out of the fit.

In the fit, the ſpaſms are to be appeaſed with anodynes and demulcents, ſuch as oil of ſweet almonds, and freſh ſperma ceti, internally; externally, the fat of a wild cat, or a beaver, *&c.*

Demulcents are, milk, ſweet whey, emulſions of the cold ſeeds, infuſions or decoctions of marſhmallow roots, with wild poppies, elder, ſyrup of marſhmallows.

Powders may be made with crabs eyes, cinnabar, and nitre, with a little ſaffron, powder of earth-worms, elks-hoofs, *&c.*

Externally, emollient epithems, and ſacculi, filled with carminative ingredients. As alſo lenient clyſters and laxatives of manna, rhubarb, cream of tartar, and the like.

Out of the fits, opening infuſions and decoctions; which reſolve, diſcuſs, and promote excretions; ſuch as tincture of rhubarb, dog-graſs, aſparagus, parſley, pimpinel, afterwards adding rhubarb, terra foliata, tartar, or ſal. polychreſt. and ſyrup of marſhmallows, which muſt be uſed a long while.

Some praiſe the roots of dog-graſs, and the juice of dog-graſs, as a ſpecific.

Some uſe the powder of millepedes with neutral Salts.

Epithems made of camomile flowers, leaves of ſcordium, wormwood, and carduus benedictus, elder-flowers, water and red wine, uſed often in a day, are beneficial.

But if theſe fail, after long uſe, the only refuge is in mineral waters, among which the Pyrmont is not the leaſt ineffectual.

Theſe are alſo properly uſed by way of prevention, with exerciſe, and decoctions of the aperient roots.

Of the Gravel *and* Stone.

A nephritic paroxyſm is attended with a fixed pain in the region of the loins, bloody urine, voiding of gravel or ſmall ſtones, a numbneſs of the thigh on the ſide of the part affected, a drawing up of the teſticle on the ſame ſide, a nauſea and vomiting. After the ſtone is fallen into the bladder, the urine preſently becomes very thick, turbid, blackiſh, and in great quantity.

When the ſtone or gravel begins to move and make its way into the ureters, then the pain begins, which is more or leſs ſharp according to the ſize and figure of the ſtone. It is ſometimes ſo violent, that, beſides a coldneſs of the extreme parts, there is a nauſea, vomiting, and a ſpaſtic conſtriction of the precordia, a difficulty of making water, a conſtipation of the belly, a ſtraitneſs of breath, a ſtupor of the thigh, a retraction of the teſticle to the *os pubis*, inquietude, loſe of ſtrength, a ſyncope, convulſion-fits, or a fatal ſtoppage of urine.

When the violent pain has continued for ſeveral days and nights without intermiſſion, and has brought the patient exceeding low, attended with an entire ſuppreſſion of urine, with a coldneſs of the extreme parts and convulſions of the tendons, it is a ſign that death is at hand.

Nor is it a good ſign when the ſtone has continued a long while in the ureter; for then the appetite decays, and a nauſea and reaching to vomit ſupervene, till the patient is conſumed with a hectic heat, and the approach of death is haſtened. Sometimes the pain is attended with an inflammation of the ſtomach or inteſtines. Some, from a ſtoppage of urine, fall into a dropſy of the breaſt, a lethargy, or convulſions.

The whole intention of cure conſiſts in the eaſy excluſion of the ſtone, and the preventing the breeding of others. Hoffman.

If the patient is of a ſanguineous temperament, take away ten ounces of blood on the affected ſide; and then let him drink, as ſoon as poſſible, a gallon of poſſet-drink, in which two ounces of marſhmallow roots have been boiled. Then gave an emollient clyſter.

When the poſſet-drink has been vomited up, and the clyſter returned back, give a pretty large doſe of an opiate; that is about 25 drops of the thebaic tincture, or 15 grains of the pil. ſaponaceæ.

Alſo let a bath or ſemicupium be prepared, of a decoction of althea roots, linſeed, fœnugreek ſeeds, and chamomile flowers; to theſe may be added, a few white poppy heads.

In the nephritic diſorder, the grand point is the evacuation of the ſabulary matter lodged in the pelvis of the kidneys, or in the ureters. Bleeding ſerves to remove the tenſion and inflammation; and emollient clyſters are of a double ſervice, becauſe, by fomenting the ſlender tubes, they relax the contraction, and, by unloading the lower bowels, they remove the preſſure againſt the ureters. The worm bath opens the paſſage yet more, greatly relaxing the abdominal muſcles, peritonæum, and inteſtimes; the bladder is alſo relaxed by it, and conſequently the oblique inſinuation of the ureters through its ſeveral membrances is leſs liable to obſtruct the evacuation of this ſandy matter into its cavity.

By moderate diuretics, and emollient medicines, this diſcharge is aſſiſted; while anodynes ſuſpend the pain, and procure a paralytic reſolution or a ſpaſmodic contraction of the ureters, and thereby contribute not a little to open the paſſage.

Theſe appear to be the moſt conſiderable methods for the relief of this diſorder, which is but imperfectly managed without the united aſſiſtance of all, and which, uſed together, ſeem the utmoſt that art can furniſh.

A turpentine clyster is generally accounted very serviceable in a fit of the gravel.

Heister recommends the solution per deliquium of the sal diureticus, or the terra foliata tartari, mixed with a fifth part of the thebaic tincture, of which 50 or 60 drops may be given now and then, which will ease the pain, and gently expel the stone or gravel.

When the stone is too big to pass, the diet ought to be cool and diluent, to hinder the growth as far as possible. The diuretics that gently resolve, are parsley, fennel, scorzonera, mallows, and tea; dandelion, succory, oats, barley, honey, honey and vinegar; nitrous salts, as dulcified spirit of nitre: The most soft cooling diluter is whey; the best emollients are a decoction of marshmallows and linseed tea.

When a small stone passes through the ureters into the bladder, it is generally expelled; but if it happens to stay in the bladder, it increases by the apposition of fresh matter, or in an orbicular manner, while the original stone remains like a real kernel. These additional coats are either red, white, ash-coloured, or bluish.

The stone in the bladder may cause an inflammation, with its symptoms; as also pressures, attritions, ulcers, purulent urine, stranguries, obstructions of the urethra, an inability to discharge the urine, unless in a supine posture; a hectic fever, and a consumption. Sometimes the stone gets into the urethra, and plugs up the passage.

A stone in the kidneys may be known from a dull obtuse pain therein; from bloody urine after walking in a rough way, or after violent motion of the body, especially by being shook in a coach or other wheel'd carriage; from having voided stones formerly; and from the urine's being mixed with caruncles, pus, and filaments.

A stone of the bladder is known from a pain at the time of, as well as before and after making water; from the urine coming away by drops, or stopping suddenly when in a full stream; by a violent pain in the neck of the bladder upon motion, especially on horseback, or in a coach over the stones; from a white, thick, copious, stinking, mucous sediment; from an itching in the head of the penis; from a tenesmus while the urine is discharged; by searching, with introducing the finger in the anus, or with a catheter; as also from the effects produced by the stone before mentioned.

As to the cure of the stone in the bladder, the medicines of Mrs Stephens were lately much in vogue as a dissolvent: and Dr. Hartley, by leaving out the superfluous part of them, has reduced them to the following form.

1. Take 2 or 2½ scruples of calcined egg-shells, thrice a day, in any convenient liquid, drinking after each dose a third part of the following decoction:
2. Take 2 or 2½ ounces of Spanish soap, and dissolve it in a sufficient quantity of boiling water; filter, and sweeten with honey or white sugar.

The powder may be taken in three or four spoonfuls of any liquor that is not acid: If the largest quantity of the decoction is taken, it will be best to divide it into four doses.

The egg-shells must be calcined in a crucible eight or ten hours, to bring it to a lime; and then be exposed to a dry air, for six weeks or two months, that is, till they slacken or fall off into an impalpable powder, which must be sifted and put into bottles well corked.

The taking of these medicines must be continued for some time after the complaint ceases, lest any part of the stone should remain, which would be then rugged and unequal, and occasion exquisite pain afterwards.

It is common, after a few days use of these medicines, to have a great increase of pain in making water; at which time, opiates, emollients, warm baths, fomentations, a soft diet, and rest, are proper.

Dr Hales, after several trials of the different ingredients of Stephen's medicines, found that the dissolving power of them lay in the lime. And Dr Jurin, having taken soap-lees, the ingredients of which are potashes and lime, beginning with a few drops, and increasing the quantity, till he took an ounce, or an ounce and a half, every day in a proper vehicle, was cured of bloody urine, pain, *&c.* and passed several stones; after which he had no uneasiness. Hartley thinks the capital soap-lees are best taken in milk, half an ounce of which requires half a pint of milk. He thinks an ounce and a half, or two ounces, may be taken thus every day with perfect safety.

But Hales rightly conjectured, that lime-water alone was likely to have a good effect in dissolving the stone; which put Dr Whytt upon making experiments therewith, which have happily succeeded; whence he proposes the following method of cure.

Let the patient swallow, in any form, an ounce of Alicant soap every day, and drink three pints or more of oyster or cockle shell lime-water. If the soap be taken in pills, it may be divided into three doses: the largest may be taken early in the morning fasting, the second at eleven before noon, and the third at five in the afternoon, drinking after each dose a large draught of lime-water, the remainder of which may be drank at meals, instead of the usual liquors.

The disagreeable taste of the lime-water may be mitigated by adding a very small quantity of new milk to it; and is quite destroyed by washing the mouth immediately with a little vinegar and water, and carefully spitting it out again. A dram and a half or two drams of juniper-berries, infused in every quart bottle, will mend its taste much. But if the patient dislikes pills, let him dissolve an ounce of soap in a pint and a half of warm lime-water made of shells, which have been long exposed to the weather; and take this at three different times, drinking the rest of the lime-water by itself.

If the shell lime-water cannot be had, let him take the same quantity of stone lime-water, with at least an ounce and a half of soap, because it increases its dissolving power.

If there is an invincible aversion to soap, there is reason to think, from experiments that have been made, that oyster-shell lime-water alone, taken in larger quantities, will have greater effects in dissolving the stone, than stone lime-water even when assisted by soap.

At first the patient should begin with smaller quantities of lime-water than that mentioned above, which he may increase by degrees, and ought to persevere in the use of it, especially if he finds any abatement of his complaints or symptoms of the stone's dissolving, for several months, or, if the stone be large, years; during which he should abstain from acid or fermented liquors.

For

For his drink, he may ufe milk and water, or a potion made with roots of marfhmallows, parfley, and liquorice. But if he has been accuftomed to more generous liquors, he may drink fmall punch made without acids. Spirits muft not be drank at all, nor the weak punch but very fparingly. It will be alfo proper to forbear the ufe of falt meats, honey, and acid fruits, or at moft to ufe them fparingly. Artichoaks, afparagus, fpinnage, lettuce, fuccory, parfley, purflane, turnips, carrots, potatoes, radifhes, green-peafe, may be fafely ufed; but onions, leeks, and celery, fhould be preferred to moft other vegetables.

The patient ought to drink no more of any liquor than is fufficient to quench his thirft; and he fhould retain his urine as long as he can without uneafinefs, that it may have the greater time to act on the ftone.

If the lime water occafions coftivenefs, it will be nenecefſary now and then to take a purgative; the moft proper are aloes, manna, rhubarb, fenna, or jalap.

Such as have a ftone in the bladder, fhould, while they are taking the medicines, have four ounces or upwards of tepid fhell lime-water injected into the bladder every day, and retain it as long as they can without pain, and fhould evacuate their urine immediately before injection.

Were it not for the trouble of introducing the catheter, an injection might be made at leaft twice a-day; and if a flexible catheter were always kept in the bladder, it might be done at pleafure, and the diffolution of the largeft ftone quickly procured.

That the injection of the bladder may be more fafe, and attended with lefs uneafinefs, a dram of ftarch may be boiled in fix or feven ounces of lime-water, and juft be brought to boil over the fire. The fourth part of the yolk of an egg, being mixt with fix ounces of lime-water, does not weaken its virtues any more than the ftarch, and may be occafionally ufed in its ftead.

Such as have no ftone in the bladder, but are frequently troubled with fits of the gravel in the kidneys, may probably prevent them, by drinking every morning a pint of fhell lime-water, two or three hours before breakfaft; and though it may be too fmall a quantity to diffolve the ftone, yet it may prevent any new concretions.

Of the RHEUMATISM.

THE rheumatifm chiefly attacks perfons in the flower of their age, after violent exercife, or a great heat of the body from any other caufe, and then being too fuddenly cooled, but fpares neither men nor women, old nor young, efpecially if the perfon is full of blood depraved with any kind of acrimony. The difeafe is nearly a-kin to the gout.

It begins with chilnefs and fhivering, followed by inquietude and thirft. Which is preceded with fpontaneous laffitude, a heavinefs of the joints, and coldnefs of the extreme parts. When the fever appears, there is an inward heat, chiefly about the præcordia, attended with anxiety. The pulfe is quick and ftrait, the appetite is loft, and the body coftive. In a day or two, fometimes fooner, the patient feels a racking pain, fometimes in one joint, fometimes in another, but more frequently in the wrifts, fhoulders, and knees; frequently fhifting from place to place, and leaving a rednefs and fwelling in the part vifited laft. The pain is exafperated upon the leaft motion; it fometimes attacks the loins and coxendix.

When it feizes the loins, it is called the lumbago; and there is a moft violent pain in the fmall of the back, which fometimes extends to the os facrum, and is like a fit of the gravel, only the patient does not vomit. If this difeafe is unfkilfully treated, it may continue feveral months or years, but not always with the fame violence, but by fits. If it continues and increafes, it may caufe a ftiff joint, which will fcarce yield to any remedy

Its proximate caufe feems to be the inflammation of the lymphatic arteries, of the membranes near the ligaments of the joints, but not fo violent as to bring on a fuppuration. The blood is like that of perfons afflicted with the pleurify.

Take away ten ounces of blood on the fide affected. This muft be repeated three or four times, or oftener, once every other or every third day, according as the ftrength of the patient will bear.

The diet muft be very thin, and an emulfion of the four cold feeds may be prefcribed; and alfo a poultice of white bread and milk, tinged with a little faffron, may be laid on the parts affected.

If the patient cannot bear frequent bleeding, after the fecond or third time, give the common purging potion every other day, and an ounce of diacodium at night, till the patient recovers.

If the rheumatifm begins with a febrile effervefcence, temperate diaphoretics, with nitrous things, in a moderate dofe, and often repeated, are beneficial; fuch as crabs-eyes, burnt hartfhorn, amber, cinnabar, purified nitre, with diapnoic and gently anodyne waters, alfo citron-juice, or its fyrup. The common drink fhould be whey acidulated with citron-juice or cream of tartar; or decoctions of the fhavings of harfhorn, roots of fcorzonera, fuccory, liquorice, or fennel-feeds.

To purge, it may be proper to chew or eat rhubarb, from two fcruples to a dram, with raifins or currants.

In an incipient rheumatifm of the fhoulders, nothing is better than a blifter laid between the fcapulæ.

But if the patient happens to be plethoric, nothing is better than a decoction of the fudorific woods, to the quantity of a quart a-day, for a month or fix weeks together.

This laft is good in the venereal rheumatifm, when affifted with crude antimony and mercurius dulcis.

Young perfons who are temperate livers, and not addicted to ftrong liquors, may be cured by a fimple refrigerating diet, and moderately nourifhing, as certainly as by repeated bleeding; for inftance,

Let the patient live four days upon whey alone; and after that white bread may be allowed for dinner, and, on the laft days of his illnefs, he may be allowed it for fupper. When the fymptoms ceafe, he may be allowed boiled chickens, or other things of eafy digeftion; but every third day he muft live upon whey only, till his ftrength returns.

BOERHAAVE's method of cure is to the fame effect, only he advifes warm baths and ftrong blifters to be laid upon the part affected, nay, even cauteries themfelves.

Arbuthnot ſays, cream of tartar in water-gruel, taken for ſeveral days, will abate the pains and ſwellings conſiderably, by its acidity correcting the alkaline ſalts of the blood.

Ridley uſed mercurius dulcis in rheumatic caſes, as a purge, with good ſucceſs, giving a ſcruple in conſerve of violets over night, and three pints of epſom waters, evaporated away to one half, in the morning.

Dr James has wrote a treatiſe to prove the efficacy of mercurial preparations, as well in the rheumatiſm as in the gout, which is ſupported with very good authorities.

And Huxham ſays, that the obſtinate rheumatic pains, which remained after the epidemical fever of 1737, would yield to mercurial cathartics; but he preferred to every elſe what he calls the eſſence of antimony, which is nothing elſe but emetic wine made with glaſs of antimony, with the addition of a little ſpicy ſtomachic. This, given to 20 or 30 drops, operates by gentle ſweats, and purges in a larger doſe very mildly.

Hoffman likewiſe recommends mercurials and antimonials in particular caſes; that is, when a violent and obſtinate pain afflicts the lower parts of the body, about the oſſa iſchii and the os coccigis, and the patient is of a robuſt conſtitution, then the more powerful chemical medicines may be made uſe of, ſuch as mercurius dulcis, the ſolar precipitate rightly prepared, or the medicinal regulus of antimony, to which a decoction of the ſudorific woods may be added. From ſuch medicines as theſe great relief may be expected.

Cheyne ſays the hot and inflammatory rheumatiſms have all the ſymptoms of the gout, and like it change from place to place and by over violent evacuations may be tranſmitted upon the noble organs. And by the way it may not be amiſs to obſerve, that exceſſive bleeding, and other violent evacuations, conſtantly bring on a hectic or dropſy on the patient in this caſe; diſeaſes of a much more dangerous nature in themſelves, and far more difficult to be cured, than the original one. And therefore in this diſeaſe, only premiſing ſo much bleeding as will prevent a fever and mortification, and ſomewhat abate the pain (which gentle doſes of calomel and gum guaiacum will do more effectually, though not more ſpeedily, than bleeding itſelf) the reſt is to be done by large doſes of the bark and Æthiops mineral mixed; and a relapſe prevented by gentle doſes of gum guaiacum, with antimony diaphoretic, and cinnabar of antimony.

Pringle obſerves, that rheumatiſms are generally mild, though they ſometimes appeared with all the violence taken notice of by Sydenham. For which reaſon the firſt ſort were generally cured in two or three days by twice or thrice bleeding, and promoting a diaphoreſis by the cooler medicines, particularly by vinegar-whey. But if it was intended with an inflammatory ſwelling of the joints, ſweating was improper, and the cure was only to be obtained by repeated and almoſt daily bleedings. But then it is to be carefully remarked, that thoſe were afflicted with it who were beſt able to bear theſe evacuations; and in this diſeaſe he thinks frequent bleedings weaken the body leſs than in any other.

If the pain and ſwelling of the joints remain after this treatment, three or four leeches muſt be applied to the part where the inflammation and tumour are the greateſt, and the blood is to ooze till it ſtops of itſelf. This may be repeated freely without danger. But unleſs there is both an inflammation and ſwelling, leeches will do no ſervice. The beſt internal medicines, in a true acute rheumatiſm, are neutral ſalts, with very ſmall doſes of camphor. The diet muſt be of the loweſt kind. All outward applications are to be omitted as long as any fever or inflammation remains.

The chronic rheumatiſm is either the remains of a rheumatic fever, or a continuation of pains that proceeded at firſt from leſſer but neglected colds. The blood in this caſe is ſizy. It is an obſtinate diſeaſe, but bleeding is the moſt efficacious remedy. Eight ounces of blood is to be taken away once in eight or ten days, as long as it is ſizy, or the complaints remain.

Bleeding has been repeated, in many caſes, three or four times, to no manner of purpoſe; nor would the pains abate without deobſtruents, diaphoretics, purges, and anodynes. Sometimes they have yielded to the cold bath alone.

Dr Clerk of Edinburgh declares the Arthritis Vaga, or flying gout, erroneouſly called the Scorbutic Rheumatism, may be often diſtinguiſhed by the urine of the patient; for certain filaments float in it not ſo tranſparent as the urine itſelf, but when taken out they appear as pellucid as cryſtal. They will rope to a great length, and when dried turn to a white calx. This he takes to be the morbific matter of the gout, gravel, goutiſh ſciatica, and all true arthritic pains, diſtinct from the rheumatiſm. Soap is the beſt diſſolvent of it yet known, half an ounce of which to an ounce may be taken in a day for a month together, if neceſſary, in the ſciatic and other arthritic pains.

Of the Gout.

The gout is a very painful diſeaſe, whoſe ſeat is in the joints and ligaments of the bones of the feet; the principal times of its invaſion are the ſpring and the autumn.

In treating of this diſeaſe, we ſhall firſt give an account of the regular gout, and afterwards of the irregular.

The regular gout uſually ſeizes the patient in the latter end of January or the beginning of February all of a ſudden, and without any previous notice, unleſs the patient has been troubled with crudities of the ſtomach and indigeſtion for ſome weeks before; the body likewiſe may have ſeemed to have been puffed up with wind, with a kind of heavineſs, which daily increaſes, till at length the fit comes on; a few days before which, there is a torpor, and as it were a deſcent of wind down the muſcles of the thigh, with a kind of ſpaſmodic affection of them. Likewiſe, the day before the fit, the appetite is more voracious, but not natural.

Though the patient ſeems to go to bed in good health, yet about two in the morning he is awakened by a pain which moſt commonly affects the great toe, ſometimes the heel, the ancle, or the calf of the legs, which pain reſembles that of diſlocated bones; there is likewiſe a ſenſation as if water almoſt cold was poured on the membranes of the part affected. Soon after, a ſhivering and ſhaking ſupervene, with a feveriſh diſorder. The pain which at firſt is tolerable, becomes more violent in proportion as the

the ſhaking decreaſes, and grows more intenſe every hour till night, and then it is at the height; ſettling itſelf about the little bones of the tarſus and metatarſus, whoſe ligaments it affects. Now there ſeems to be a violent extenſion of the ligaments, or there is a ſenſation of their being lacerated, or gnawed by a dog. Sometimes they ſeem to be preſſed or ſqueezed together. At this time the part affected becomes ſo exceeding ſenſible, that they cannot bear the weight of the ſheet, nor the ſhaking of the room by a perſon's walking about.

The patient is now in great torture, and is continually ſhifting his foot from place to place in hopes of eaſe. His body likewiſe is in as conſtant agitation as the part affected. This always happens at the acceſſion of the fit. But the pain continues without remiſſion till two or three in the morning, that is, twenty-four hours from the firſt onſet, at which time he begins to be at eaſe, which he is willing to attribute to the laſt poſture in which he placed the affected member. Now he falls into a gentle breathing ſweat, and gets a little ſleep, and, when he awakes, perceives the part to be ſwelled, and the pain much abated; for before, the veins of the member, being turgid, were only more conſpicuous than uſual.

The next day, or perhaps two or three days afterwards, if the gouty matter is copious, the part affected is a little in pain, which grows more violent towards the evening, and abates at the crowing of the cock.

In a few days the other foot begins to be affected in the ſame manner; and, if the pain has ceaſed in the firſt, the weakneſs which is left behind ſoon vaniſhes. The ſame tragedy is now acted over again. Sometimes, when the gouty matter is in great plenty, it attacks both feet at once, but it generally ſeizes one after the other.

After both the feet have been tormented, the fits which follow are out of rule, both as to the time of invaſion and the duration; only the pain grows more intenſe at night, and remits in the morning.

From a ſeries of theſe ſmall fits ariſes what is called a fit of the gout, which is longer or ſhorter, according to the patient's age. For it is not to be ſuppoſed that, when a patient has been laid up with the gout two or three months, that it is a ſingle fit, but rather a ſeries or chain of ſmall fits, which continually grow ſhorter and milder, till the peccant matter is at length conſumed, and the former health reſtored. This happens to the more vigorous, and whom the gout ſeldom viſits, in fourteen days; to perſons advanced in years, who have often felt its rage, in two months; but thoſe who are debilitated with age, or the long ſtay of the diſeaſe, it does not leave, till ſummer, being pretty far advanced, drives it away.

For the fourteen days the urine is higher-coloured, and depoſites a ſediment like gravel, and not above one third of what the patient drinks paſſes off by urine; the body on the firſt day is coſtive, the appetite decayed, there is a ſhivering towards the evening, as alſo a heavineſs and troubleſome ſenſation in the parts not affected. When the fit goes off, there is an intolerable itching in the affected foot, chiefly between the toes, from which and from the feet fall branny ſcales, as if the patient had ſwallowed poiſon.

The diſeaſe thus terminated, the patient's good habit of body and appetite return in proportion to the ſeverity of the pain in the laſt fit; and in the ſame proportion the next fit will be either accelerated or retarded; for, if the laſt fit was very ſevere, the next will not come on in leſs time than a ſolar revolution.

Hitherto you have an account of the regular gout, and its genuine phænomena; but when it is diſturbed by incongruous medicines, and the patient is worn out by the long continuance of the diſeaſe, it becomes irregular, and the ſubſtance of the body is as it were changed into a fomes of the diſeaſe, and nature becomes unequal to the taſk of conquering the malady thus changed, in the accuſtomed manner.

The feet were at firſt the ſeat of the diſeaſe, but now it attacks the hands, wriſts, elbows, knees, and other parts of the body. Sometimes it ſo diſtorts the fingers, as to make them reſemble a bunch of parſnips, and at length ſtony concretions appear about the ligaments of the joints, which, breaking through the ſkin, reſemble chalk, or crabs eyes. Sometimes the gouty matter invades the elbows, and creates a whitiſh ſwelling of the ſize of an egg, which ſoon aſſumes a red colour, and becomes inflamed. Sometimes it affects the thigh in ſuch a manner, as if a great weight was hanged thereon, and yet without any remarkable pain. From thence it deſcends to the knee, which it handles more roughly, hindering all motion, for the patient continues in the ſame place and poſture as if he were nailed to the bed.

Now the gout afflicts the patient all the year, except two or three months in ſummer; and the particular fit, which did not laſt above a day or two, continues ten or fourteen days; and the firſt or ſecond day after the onſet, he is diſturbed with ſickneſs as well as pain, and a total loſs of appetite.

His limbs alſo begin to be contracted and unapt for motion; and though he can ſtand, and perhaps creep about a little, yet ſo ſlowly, that you can ſcarce perceive he gets forward at all. If he ſtrives beyond his ſtrength, hoping by exerciſe to regain his legs, and to become leſs ſuſceptible of pain, the fomes of the diſeaſe will attack the viſcera in a more dangerous manner. The urine is like that of a perſon troubled with a diabetes, and there is a troubleſome itching in the back and other parts, eſpecially at bed-time.

Nature being at length oppreſſed with the diſeaſe and old age, the fits begin to grow more mild, and, inſtead of the uſual pain, there is a kind of ſickneſs, with a pain in the belly, a ſpontaneous weарineſs, and ſometimes a diſpoſition to fall into a diarrhœa; which ſymptoms vaniſh as often as the pain returns to the joints. And thus, the patient being alternately afflicted with pain and ſickneſs, the paroxyſm becomes very long and very tedious.

This diſeaſe ſeldom invades any patient till he is upwards of thirty, and men are more ſubject to it than women; as alſo perſons of acute parts, who follow their ſtudies too cloſely, eſpecially in the night, with an intenſe application of mind. Likewiſe thoſe who live high, and indulge their appetites, drinking plenty of rich generous wines; or who uſe acids too freely, or white eager wines; or who have been addicted too early to venereal pleaſures; or whoſe bodies are large, groſs, and full.

Thoſe

Thoſe alſo are liable to it, whoſe ſweaty feet are too ſuddenly chilled; or who ſuffer their feet to ſweat in wet ſhoes and ſtockings. Hence hunting and riding in in the cold are pernicious. It may likewiſe be received by contagion, and is hereditary, deſcending from father to ſon.

The curative indications require, firſt, that the primæ viæ be ſet free from a load of indigeſted crudities. and the viſcera be reſtored to their priſtine vigour: that by theſe means the aliments may be duly concocted and aſſimilated into healthy fluids, and ſuch as will paſs freely through the ſmalleſt veſſels; while whatever is unfit for nouriſhment may paſs off by perſpiration, in due time and quantity. Secondly, that the fluid ſtagnation in, and ſtuffing up the ſmalleſt veſſels, may be expelled the body, and a free paſſage through the contracted veſſels be reſtored.

The firſt intention may be anſwered by vomits and gentle cathartics, repeated as occaſion requires; by bitters, aromatics, antiſcorbutic medicines; by alkaline fixed ſalts, taken in ſmall quantities for a long time; by aliments and drinks that are nouriſhing, light, eaſy of digeſtion, quickly aſſimilated and taken in due quantity; by powerful exerciſe often repeated and long continued, and eſpecially by riding in a dry, pure, ſerene air; by friction, by motion of the affected parts, by going to ſleep at early hours.

The ſecond intention may be anſwered partly by the preceding article, as well as by procuring gentle ſweats, by bathing in natural and artificial baths; by ſweating in a bagnio; or by the uſe of volatile ſalts, and copious drinking of attenuating liquors actually hot, in the morning while in bed, in order to procure a ſweat; as alſo by mercurial purges, taking a large quantity of diluents after them; by frictions of the whole body, eſpecially the parts affected, with hot, dry linen cloths, till a redneſs appear; by cold baths, and the like. Theſe things being uſed with prudence, and according to the various temperaments of the patient, will yield no ſmall relief, even in the nodous gout itſelf.

As the proximate cauſe lies in the vitiated ſtate of the ſmalleſt nervous veſſels of the body, and of the fluid that paſſes through them, it is no wonder that bleeding will not reach the matter, ſtate, or cauſe of the diſeaſe; yet it may ſometimes do good by accident, by cauſing a ſmall revulſion, and by abating the urgent ſymptoms.

Nor will emetics or cathartics yield ſo much relief as is commonly thought, becauſe they often raiſe a diſturbance in the nervous fluid, diminiſh the other fluids, and weaken the expulſive faculty. But much greater benefit may be expected from ſudorifics rightly adminiſtered.

Nothing is more fatal than to hinder the gouty matter, now grown mature, and remaining unexpelled, as well as uncorrected by proper medicines, from falling on the uſual parts, which indeed cauſe great pain, but no danger. If it invades the brain, it will occaſion apoplexies, palſies, a delirium, weakneſſes, dozing, tremors, or univerſal convulſions: If it attacks the lungs, it produces an aſthma, a cough, or a ſuffocation: if the intercoſtals and pleura, a convulſive pleuriſy; if the abdominal viſcera, nauſeas, anxieties, vomiting, belching, gripings, or ſpaſms of the viſcera. It is almoſt incredible how many diſeaſes it creates, which are ſuddenly mortal; or at leaſt not to be cured but by reviving the fit of the gout, which had been diſturbed, and rendering it as ſevere as poſſible.

Theſe laſt mentioned evils happen from injudicious applications of narcotics, refrigerants, aſtringents, or incraſſants; or from medicines which cauſe a revulſion from the diſeaſed part, or from debilitating, evacuating, or ſuffocating remedies. Hence bleeding, purging upwards or downwards, plaſters, poultices, of the nature abovementioned, and all opiates, produce theſe effects; as alſo a ſpontaneous weakneſs brought on by extreme old age; or from the extreme parts being ſo obſtructed, corrupted, withered, or periſhed, that the morbific matter cannot paſs through them any longer.

To abate the exceſſive pain in the part affected, if there be an abſolute neceſſity, opiates may be given internally, and the patient may drink plentifully of hot whey, or any other liquor of the like nature. External emollients and anodynes may be uſed laid on pretty hot, or the part affected may be beat with nettles, or it may be anointed with terebinthinated balſam of ſulphur, or tow may be burnt thereon.

Though there is nothing of any moment to be done in the fit, yet it will be proper to abſtain from fleſh for ſome days, and to live upon water-gruel, or ſuch like diet; but no longer than the ſtomach is averſe to fleſh, for fear of bringing on a diſturbance of the animal ſpirits; but then great care ſhould be taken in the diet, both as to quantity and quality.

As ſoon as the pain is almoſt gone, and the ſwelling and the weakneſs only remain, nothing can be better than warm ſtomachic and ſpicy purges, doſed and repeated according to the ſtrength of the patient. This being premiſed, if the patient's ſtrength is impaired, and his fleſh waſted, give aſſes milk with pearl, half a pint or a pint in a morning early, and at five or ſix o'clock in the afternoon; and to keep up the appetite which the milk commonly palls, and to prevent its cooling effects on the ſtomach, a light bitter made of gentian, cinnamon, and orange-peel only, the laſt double to the other two, infuſed in ſherry or white wine, and taken two hours before meals, may be uſed moſt conveniently. This courſe may be continued two or three weeks; after this a courſe of Bath or German-ſpaw waters with ſteel, riding, a light white food diet, and generous wine drank temperately, will be moſt proper.

Out of the fit, thoſe things are moſt proper which promote the concoction of the aliment, whether by medicines, exerciſe, or diet.

In the diet there is a medium to be obſerved; the patient ſhould neither eat more than the ſtomach will digeſt, nor be ſo abſtemious as to defraud the parts of ſuch a proportion of aliment as is neceſſary to maintain the ſtrength and vigour. As to the quality of the food, the patient's palate is to be conſulted: but he ſhould dine upon one diſh of meat only; for ſeveral kinds of fleſh, eaten at the ſame meal, diſturb the digeſtive faculty more than the ſame quantity of any one ſort. As for other things, the

the patient may feed upon what he likes beſt, provided it is not ſharp, nor ſalted, nor ſeaſoned with ſpices. He ſhould eat no ſupper; but inſtead thereof ſhould drink a draught of good ſmall-beer, whereby the breeding of the gravel may be prevented. If the patient is troubled with the gravel or ſtone, and makes bloody water, he may purge with manna once a week, and take a paregoric at night.

The moſt ſuitable drink is ſuch as is not ſo ſtrong as wine, nor ſo weak as water, for the latter by its coldneſs will deprave the ſtomach. Of this ſort is the London table-beer, or water with a little wine. But, when the gouty matter has ſeized the whole body, he muſt abſtain from all fermented liquors, though ever ſo mild and ſmall.

But if the patient has been uſed to ſtrong or ſpirituous liquors, or is advanced in years, or through weakneſs cannot digeſt his aliment, he may, at meals, indulge himſelf with a draught of Spaniſh wine, which is better than French.

Regard muſt likewiſe be had to the ſymptoms, which, in the fit, endanger the patient's life. The moſt common is a weak and languid ſtomach, attended with ſickneſs and gripes, as if from wind. In this caſe nothing is better than a glaſs of Canary drank now and then, together with exerciſe. But, if the ſymptoms will not admit any truce, give twenty drops of the thebaic tincture in ſpirituous alexitereal water, provided the head is not attacked, and let the patient compoſe himſelf to reſt.

If the nephritic pains ſhould come upon the gout, which often happens, let the patient omit all other medicines, and drink a large quantity of poſſet-drink, in which the leaves and roots of mallows and marſhmallows have been boiled. Then let a clyſter be given, and afterwards a large doſe of laudanum.

When the gout has ſeized on the head, it is to be treated as any other head-each, or as an inflammation of the brain and its membrane; bleeding in the arm or jugular, cupping on the back, and bliſtering between the ſhoulders, but eſpecially on the ancles, to give the gouty humour a vent downwards. In young and ſtrong conſtitutions mercurial and antimonial vomits will do wonders. Likewiſe gentle ſtomach purges are to be poured down continually, that is, two or three ſpoonfuls every third hour, till the effect is obtained.

Mercurial vomits are not only proper for the gout in the ſtomach, but they are abſolutely neceſſary as well as mercurial purges, when the gout becomes fixed to, and permanent in a place, as alſo when it is diſperſed all over the habit like a rheumatiſm. Theſe active medicines muſt firſt render the humours fluid, which gum guaiacum, with diaphoretic antimony, perſiſted in, will afterwards carry off.

Of the Sciatica, *or* Hip-Gout.

The ſciatica is a violent and obſtinate pain in the hip, chiefly in the joint where the head of the thigh-bone is received into the acetabulum of the coxendix. The pain will ſometimes extend itſelf to the lower part of the loins, to the thigh, leg, and even to the extremity of the foot; yet, outwardly, there is no ſwelling, no inflammation, nor change of colour in the ſkin.

Sometimes there is ſuch a ſpaſm of the muſcles on the ſide affected, that the patient cannot ſtand upright, without the utmoſt pain.

When the ſciatica has continued very long, there is ſuch a collection of pituitous humour in the cavity of the joint, that, by relaxing the ligaments, it often cauſes a luxation. Sometimes it cauſes an aridura, or waſting away of the adjacent parts.

When the pain leaves the hip, and moves downwards, it is a ſign that the ſpaſms are reſolved. A violent motion of the body generally exaſperates the pain.

After a gentle cathartic, or clyſter, bleeding will be proper, eſpecially in the ancle; alſo leeches applied to the hæmorrhoidal veins have been found beneficial Strong purges are hurtful; but mercurius dulcis given with ſcammony, or ſome other purgative, will be of ſervice.

If the patient is old or weak, lenient purges will be moſt proper; and on the intermediate days a doſe of calomel, which is afterwards to be purged off; and ſo repeated alternately for ſome time.

Baglivi obſerves, that if nothing elſe will do, in pains of the external parts, recourſe muſt be had to cauſtics, particularly the leaves of ranunculus, or a mixture of quicklime and ſoft ſoap, which are beneficial in the hip-gout.

Cheyne obſerves, that when the gout is diſperſed over the whole habit, or is fixed and ſettled on a particular joint, mercurial vomits and purges are neceſſary to diſlodge it; but the ſciatica will not yield to this, and but rarely to any other methods of uſe; but, by the following method, a perfect cure may always be obtained, if the diſtemper is a genuine ſciatica, though of many years ſtanding.

It conſiſts in taking one, two, or three drams, to half an ounce, according to the ſtrength of the patient's ſtomach, of the ethereal oil of turpentine; which is that which comes off between the ſpirit and the oil in drawing off the common oil of turpentine; this is to be taken in triple the quantity of virgin-honey, in a morning faſting, for four, five, ſix, or eight days at fartheſt, intermitting a day now and then, as the patient's occaſions require, or his ſtomach ſuffers by it. Large draughts of ſack-whey muſt be drank after it, to ſettle it on the ſtomach, or carry it into the blood; likewiſe every night muſt be taken a proper doſe of Matthew's pills [or half a ſcruple of the *pil. ſaponaceæ*] that is, if the oil has been taken in the morning.

To remove the groſſer remains and ſtrengthen the weakened part, the patient muſt take a dram or two drams of flower of brimſtone, for ſome time twice a-day, in a tea-cup full of milk. If through great intemperance, or a violent cold, the patient relapſes, let him repeat the former medicines for a day or two. Then, to ſtrengthen the *primæ viæ* and enliven the ſpirits, let him drink the Bath or Spaw waters with ſteel, and bitters with volatiles.

Of a Virulent Gonorrhoea.

A virulent Gonorrhœa, or Clap, proceeds from impure coition with an infected woman.

This diſtemper begins and makes its progreſs in the following manner. The patient, ſooner or later, according as the woman with whom he has had converſation was more

more or leſs infected, and according to his conſtitution, by which he may be more or leſs diſpoſed to receive the infection, is firſt ſeized with an unuſual pain in the genitals, and a kind of ſenſation like a rotation of his teſticles. Afterwards, if the prepuce conſtantly cover his glans, there appears an eruption or puſtule, which by its ſize, colour, and figure, reſembles a ſpot of the meaſles; preſently after appears a weeping matter like ſemen, which daily changes colour, and becomes more purulent and more yellow, till at length, if the diſorder be highly virulent, it aſſumes a greeniſh hue, or appears like a thin ſanious matter mixed with blood.

The puſtule at length becomes an ulcer, commonly called a chancre, at firſt not unlike the thruſh in childrens mouths, which, daily eating deeper and wider, at laſt is encompaſſed with hard and callous lips.

Thoſe whoſe glans is uncovered, ſeldom have ſuch a puſtule, either becauſe it is hardened by being continually expoſed to the air, or by the frequent rubbing of the ſhirt, and ſo is leſs liable to imbibe the infection.

The running brings on a heat or ſmarting in making water, which is moſt violent when it is over, for then it ſeems to burn the whole duct of the urethra.

Another ſymptom is the cordee, or contraction of the frænum, by which the penis is bent downwards. There is likewiſe, when the penis is erected, great pain as if compreſſed tranſverſely with a ſtrong hand. This chiefly happens in the night, when the patient is warm in his bed.

Sometimes the urethra being eaten and excoriated with long running of the acrimonious pus, nature breeds a ſoft ſpungy fleſh, to ſupply the defect, which daily increaſing forms caruncles or carnoſities, ſo far as to plug up the urinary paſſage and ſtop the urine. However, the little adjoining ulcers continue to pour forth a kind of an ichor; and this ſtate is not only troubleſome to the phyſician, but almoſt as bad as death to the patient.

It alſo often happens, through ſome violent motion, or the ill-timed uſe of aſtringents, that the ſanies which ſhould be carried off by the gonorrhœa, is tranſlated to the ſcrotum, and cauſes one or both of the teſticles to ſwell and inflame with intolerable anguiſh and pain; the running at the ſame time decreaſing, while the ſcalding of the urine is as great as ever.

To theſe ſymptoms may be added the phimoſis, which happens when the prepuce cannot be drawn back to uncover the glans; but this the caſe of many in a healthful ſtate. Alſo the periphimoſis or paraphimoſis, when the prepuce, being ſwelled, cannot be brought forward to cover the head of the penis. There are ſometimes alſo watery bladders or veſicles called cryſtallines, and at length buboes or ſwellings of the glands in the groin. When theſe laſt appear, the lues venerea is generally ſuppoſed to begin.

Women are not ſubject to ſuch a variety of ſymptoms as men; their chief complaints being a difficulty of urine, and a running; however, they are liable to chancres and venereal warts as well within as on the outward parts of the labia pudendi, as alſo to buboes in the groin. As for the coarctation of the ſphincter vaginæ, purſing up as it were the external orifice, this is not a phimoſis, though by ſome improperly ſo called.

The cauſe of a virulent gonorrhœa is a taint by impure coition, conveyed from a woman infected with a malignant gonorrhœa, or the lues venerea, firſt to the genitals of a man, and afterwards through the pores to the lymph or ſeminal liquor; the due craſis and natural mixture it entirely deſtroys, by inducing partly a cauſtic and corroding, and partly a putrid ſtate thereof. Hence ariſe the pains and heats, the tumours, the inflammations, and the exulcerations of the genitals: For at firſt the glans is only affected, whilſt, in coition, the poiſon inſinuates itſelf into the open pores. Then it ſoon proceeds to the glans of the urethra, then to the proſtatæ, which are porous, and afterwards to the veſiculæ ſeminales.

If the infected lymph is conveyed to the inguinal glands through the lymphatic veſſels, which Cowper diſcovered to run from the prepuce to the groin; then a venereal bubo is formed, which is a hard tumour without pain. But if the ſeat of the gonorrhœa is deeper, and an inflammation ariſes at the beginning of the urethra, where the veſiculæ ſeminales diſcharge the ſeminal fluid, then theſe veſſels are ſo compreſſed by the tumour, that the ſemen cannot be conveyed to them from the teſticles, whence it happens that the teſticles ſwell.

As to the prognoſtics, we muſt obſerve, that the greater the infection is, the more violent and obſtinate the diſorder will prove; though it ſeldom brings on a pox unleſs the diſcharge is imprudently ſtopped by the prepoſterous uſe of ſudorifics and aſtringents; for, immediately on the ſuppreſſion of the diſcharge, buboes, tumours of the ſcrotum and teſticles, caruncles of the urethra, and other terrible ſymptoms appear, together with a confirmed pox. The more regular the diſcharge is made, the more mild all the ſymptoms are.

But when the running is ſmall in quantity, the urine is highly fetid, and the matter yellow or green, it is a bad ſign.

It is a certain ſign the diſorder is mitigated, when the painful conſtriction of the penis in erection, and the heat of urine, are removed; as alſo when the impaired ſtrength begins to return, and the countenance, which before was pale, aſſumes a florid or a natural colour.

It is a ſign the gonorrhœa is cured, if, upon compreſſing the penis, a drop or two of thin limpid liquor, like the white of an egg, is diſcharged.

The regimen, during the time of the cure, requires the patient to abſtain from all oily food; and he muſt alſo avoid every thing which by its acrimonious quality ſtimulates to venery; ſuch as ſpices, bulbous roots, fleſh, eggs, fiſh, and fermented liquors; for the inflation of the penis retards the cure. This is of the utmoſt conſequence; and therefore all venereal incitements, ſuch as obſcene books, and whatever elſe inflames the fancy, ſhould be ſhunned like death.

Water and whey are the beſt drink, and ſeeds and ſummer-fruits the beſt aliment.

All poſſible care muſt be taken that cold never reach the penis; and that it be kept always moiſt, leſt the pores contracting repel the flux of matter. An emollient and ſomewhat antiſeptic cataplaſm will be beneficial.

In the place of mercurials given internally, Aſtruc directs

rects the use of crude quicksilver, as in the common unction, to be rubbed upon the parts, as about the body of the penis, especially under the urethra to the perinæum, and so up to the pubes and testicles.

Turner approves of this method in all local affections, such as chancres, a phimosis and paraphimosis from a venereal taint: As also when there is a callosity in the urinary passage, or an induration of the testicles, particularly their epididymes, left after the hernia humoralis, and the like. Nor does he disapprove of it in common claps during the course of the purgation.

If there is no discharge of virulent matter from the penis, it is called gonorrhœa sicca, or a dry clap, the symptoms of which are a dysury or difficulty of making water, and after, from the increase of the inflammation and tumefaction, an ischury or total suppression of urine.

In the cure of the dry clap, Astruc advises plentiful bleeding in the beginning, to take off the tension, and to abate the inflammation; as also emollient decoctions of mallows, linseed, *&c.* in milk, to foment the parts; but perhaps it might be better to make a poultice of these ingredients, after Boerhaave's method, to lay to the parts affected; or, which is best of all, to use them one after the other.

He likewise advises lenient clysters, cooling emulsions, and ptisans with sal prunella and anodynes between whiles. During the continuance of the inflammation, no mercurials must be used; and if the symptoms increase, threatening an abscess outwardly in the perinæum, it is to be forwarded as much as possible by suppurative poultices, and the matter discharged.

Of the Cure of the Symptoms.

I. *Of the* Hernia Humoralis, *or Swelling of the* Testicles.

Astruc, in the cure, recommends frequent bleeding, and an antiphlogistic regimen, and fomenting the parts with a decoction of mallow-roots and linseed; or milk pretty warm; or an anodyne cataplasm of lily-roots, with leaves of henbane, mallows, and branc ursine, boiled to a mucilage, and mixed with the flower of linseed and oil of lilies. After the inflammation and fever are abated, he advises a gentle purge; after mild resolvents externally, and antivenereals internally.

The hardness of the epididymes is to be discussed by succinated balsam of sulphur, mercurial plasters, and ointments. During the use of these applications, a suspensory bandage should not be neglected.

When pus is formed in the testicles, it must be discharged with a lancet. If it should leave a fistulous ulcer, he advises a mercurial ointment.

II. *Of a* Bubo.

Astruc asserts, that venereal buboes are of two kinds: the first is essential, happening immediately after coition with an infected person; the second symptomatical, which follows the suppression of the gonorrhœa, or the drying up of the ulceration. He likewise mentions a third, which does not appear so early as the other two, and is therefore a pathognomonic sign of a lues venerea or pox.

He proposes to cure it by mercurial purges, to carry off the humour; in the mean time rubbing a mercurial ointment into the part, to dissolve the induration; which he thinks is more gentle and easy, than to promote the suppuration by ripening poultices, and then opening the tumour by a caustic, giving mercurials inwardly at the same time.

De Salt cures all the symptoms by rubbing into the parts a strong mercurial ointment, causing the patient to anoint himself from the anus all along the urethra to the glans and prepuce. The following day he gives a strong dose of jalap, that is, from two scruples to a dram. His diet drink is to be spring-water in which mercury revived from cinnabar has been boiled. If the patient cannot bear much purging, he may have a truce for a day or two, but the ointment is to be continued every night. The first friction gives considerable relief, the second yet more, the third commonly makes the pain cease, and the fourth and fifth generally silence the complaints. Five or six weeks generally perfects the cure.

In buboes, the patient is to rub the ointment into the groin, scrotum, and parts in either sex; purging every day, and drinking the mercurial water; by which means the buboes melt away, the phimosis, paraphimosis, and chancres disappear, and the former health returns. If there is matter already formed in the bubo, then he allows it must be opened. Heister's method is much the same.

III *Of* Caruncles *and* Carnosities *in the* Urethra.

The obstacles which hinder the free passage of the urine, according to Astruc, are these which follow. 1. Ulcers in the urethra. 2. Cicatrices left behind after the healing these ulcers. 3. Caruncles. 4. A schirrus on the verumontanum, or caput gallinaginis. 5. Indurations of the prostatæ and vesiculæ seminales. 6. Carnosities rising in and straitening the canal.

He proposes to cure the ulcers by the same regimen as the first period of a gonorrhœa, *viz.* by repeated bleedings, lenients and refrigerants, to abate the fluxion, and take off the inflammation.

Turner, in the worst cases, would not have the urethra laid open, but only have the perinæum well greased with the mercurial liniment, by which he has known many large callosities insensibly dissolve, while the candle or leaden probe, smeared also therewith, has been kept within.

But there has been lately introduced into practice by Daran a new method of curing these disorders with bougies, the composition of which he keeps a secret.

According to him, if the canal of the urethra be open enough to admit the extremity of the bougie, a suppuration will ensue from the diseased part of the urethra, which will in time relax and open the stricture; or, if the stricture opposes the entrance of the bougie, yet still the mere point of the bougie will suppurate it in a small degree, and by and by, though much more tediously than in the other case, by relaxing, open it.

The first discharge procured by a bougie is generally very sanious, and evidently flows from the place where the obstruction is, that part of the bougie only being covered

covered with matter that anſwers to the obſtruction. Again, the cordee, excited by the uſe of the bougie, is infinitely more painful where the obſtruction is, than in the other parts of the penis. It will, it muſt be owned, produce a cordee in a ſound penis; but then it extends through every part of it, and is by no means ſo painful as the other.

If the ſymptoms of the ſtrictures, callous ſcars, caruncles and tumours of the corpus ſpongioſum urethræ are eſſentially different, thoſe differences are not mentioned by any writer; except that, when the urethra only is affected, the patient, in making water, voids matter before his urine; but when the proſtate glands or veſiculæ ſeminales only are concerned, matter follows the laſt drop of urine. But it frequently happens that one is complicated with the other.

The properties requiſite in a bougie, are a ſufficient degree of firmneſs, that it may be introduced with ſome force: A ſuppleneſs and tenacity, that it may conform to the motions of the body without breaking: A lenient ſuppurative diſpoſition, to bring on a diſcharge without pain: And, laſtly, a ſmoothneſs of ſurface, that it may not only be introduced with more eaſe, but that it may lie eaſy in the paſſage till it begins to diſſolve.

That chiefly made uſe of is as follows;

℞ *Emplaſt. commun. cum pice Burgund.* ℥ij. *Argent. viv.* ℥j. *Antimon. crud. pulv.* ℥ß. *M.*

The *emplaſt. com.* or diachylon, muſt be made with oil and a little Burgundy pitch added to it, to render it ſufficiently tenacious: the antimony muſt be finely levigated, that it may give a ſmoothneſs and good conſiſtence to the bougie.

The quickſilver, whether it be divided in *balſ. ſulph.* or honey, muſt not be put into the plaſter till the moment before the bougies are made, nor muſt the plaſter be boiling hot at that time. When the quickſilver is mingled with the plaſter moderately hot, ſlips of fine rag muſt be ready to dip in the compoſition. They muſt be of different lengths, from ſix to nine or ten inches, and about three inches broad. Roll them up looſely, and, taking hold of one extremity with the left hand, let it fall gently on the ſurface of the plaſter, and then draw it out gently. As it is drawn out, it will unroll, and take up a quantity of the plaſter upon its ſurface, equal to the thickneſs of a ſilver groat. It may be proper to aſſiſt the unrolling with a ſpatula. The plaſter muſt be hot enough to ſoak through and diſcolour the rag. The ladle in which it is melted ought to be broad and flat at the bottom; and the plaſter muſt be kept ſtirring to preſerve it in equal conſiſtence. The bubbles on the ſurface of the cloth may be ſmoothed with an iron ſpatula a little warmed.

One rag will make ſix bougies of a moderate ſize; they are beſt cut with a knife and ruler. They ſhould be made taper at the end, by cutting off a ſlope about an inch and a half long. When they are rolled up, it muſt be with that ſide outward which is covered with plaſter; and they muſt be firſt rolled up with the finger and thumb as cloſe as poſſible, before they are rolled upon a board or marble. In the winter it will be proper to hold them a little before the fire to facilitate their rolling.

Before a bougie of any kind be introduced into the urethra, it will be neceſſary to ſmear it with ſweet oil, that it may go in eaſily, and not ſtimulate too much at firſt. The patient may either ſtand or lie down in the poſture of being cut for the ſtone; then the ſurgeon muſt graſp the penis near the glans, and extend it gently, that the urethra may not be wrinkled, and then it will meet with no impediment but what is occaſioned by the diſeaſe.

It often happens at the beginning, that the bougie cannot be too ſmall; and then the end muſt be round, that it may readily ſlip over the plicæ of the urethra; it is alſo exceedingly deſirable that it enter within the obſtruction. However, it is neceſſary to deſiſt from puſhing it when once it begins to bend. When it meets with any reſiſtance, to avoid the bending, turn it round with your finger and thumb ſeveral times, and, as you turn it, preſs it a little forwards. If by this method it advances, continue to do the ſame thing till it ſtops. But it muſt be owned that the operator in this caſe may be eaſily deceived.

The bougie muſt be confined in the penis by ſome kind of bandage, or rather we may keep it fixed in the urethra by a cotton ſtring tied about its extremity, and then paſſed round the penis; no other thread is neceſſary.

When the patient is timorous, or the part tender, it may be left in two or three hours in a day only at firſt, but otherwiſe ſix or ſeven. When the patient finds he cannot bear it, it may be diſcontinued two or three days, according to the nature of the ſymptoms.

There are inſtances of its having firſt cured, and then brought on a freſh ſtrangury. In this caſe, forbear its uſe for two or three days, and the ſtrangury will ceaſe.

Some have been able to wear it night and day without intermiſſion; and as they withdrew one, introduced another. And this is a prudent ſtep; for the more ſuppuration is procured, and the longer the urethra is kept diſtended, the cure is more likely to be radical. When this cannot be done, the day is better for its uſe than the night, becauſe in the night it is more ſubject to erections.

Two bougies in a day generally anſwer the purpoſe; one in the morning, and one in the evening, as more ſuitable to the patient's avocation; though ſome can walk about with them.

If the teſticles ſhould inflame, or any feveriſh diſorder come on, they may be kept in an hour, or half an hour in a day, to prevent the urethra from contracting again till the ſymptom is removed; to prevent theſe diſorders, the patient ſhould obſerve a cooling regimen during the treatment.

Some are relieved by the bougie in a few weeks, ſome not till many months. Generally the cure may be performed in ſeven, eight, nine, or ten weeks. This is known by the removal of every ſymptom of the diſorder; for ſome degree of running will generally continue as long as the bougie is employed.

When the patient judges himſelf well, it will be beſt to deſiſt gradually, wearing it at firſt only an hour or two in a day, and then two or three times a week, after which it may be entirely left off. If any gleet ſtill remain, or any obſtruction threatens to return, it will be neceſſary to uſe the bougie four or five weeks longer.

In ſuppreſſions of urine it will be always adviſeable to introduce the catheter if poſſible, and indeed to keep it in

in the bladder two or three or four days; after which, the canal will perhaps admit a bougie, and then, a suppuration being once procured, it may easily be preserved open.

IV. *Of a* Gleet.

In what manner, says Sharp, a gleet is furnished, cannot well be determined, without first ascertaining the exact seat of a gonorrhœa. That the lacunæ of the urethra are usually ulcerated in a gonorrhœa, is now generally assented to. Yet though all allow the existence of ulcers during that disease, they will not admit that a gleet is the discharge of an ulcer.

But it is most probable, that the running is not all of it a purulent matter, but partly matter, and partly a discharge from the secretory organs, as also from the vesiculæ seminales, when they or their ducts are affected. For the running is produced in less time after the infection than is requisite for the formation of matter in every other instance; and the appearance of matter is frequently the first alarm in a gonorrhœa, the heat of urine and other symptoms of an inflammation and ulceration following sometimes two or three days after.

For these reasons, it is supposed, that the venereal poison, in its first operation, irritates only, and thereby increases the secretion; especially as the same thing happens to the glands of the intestines from purgatives, from the salivary glands, from smoaking, *&c.* As the poison operates more strongly, the inflammation increases, and the ulcers form and extend, when not only the matter from the ulcer is sanious, but all the secretory vessels communicating with the ulcerated lacunæ separate a thinner fluid than usual; and both the matter and secreted fluids continue to be thin so long as the inflammation is violent.

It is even possible that in some slight gonorrhœas, which disappear in a few days, the venereal poison may not have activity enough to bring on an ulceration of the urethra, but only a mere irritation of the lacunæ. Besides, in other cases, the quantity of the running is generally much greater, if we may judge by analogy, than a few ulcers in the urethra could possibly furnish. Of this we have almost ocular proof in women; for, though the gonorrhœa be exceeding plentiful, yet, upon the nicest inspection, we often cannot find the least degree of ulceration of the vagina, though, if the discharge was purely the digestion of ulcers in that part, it is likely some few of them may be visible.

When the inflammation ceases, and the ulcers of the urethra heal at the same time, the cure of a gonorrhœa is perfected; on the other hand, if the inflammation be only removed, and the ulcers remain open, a gleet must ensue.

It is upon this principle of ulcers subsisting in the urethra, that Daran accounts for the action of his bougie, supposing it to have the property of healing them with a sound cicatrix after the urethra is opened. And, if in the operation it can be understood when there are ulcers, it will not be difficult to comprehend it when there are none; since it seems to have the power of opening every unsound cicatrix of the urethra, and bringing them immediately into an ulcerated state.

There are many who imagine that the prodigious increase of certain gleets at particular times, lasting only for two or three days, and then suddenly abating to their wonted quantity, is inconsistent with a purulent discharge; and therefore conclude a gleet to be nothing but a preternatural excretion from the relaxed vessels of the urethra. But it is probable, that, however the matter of a thick gleet may be furnished by secretion, still the stimulus provoking the secretion is kept up by the subsistence of ulcers; and also that, when the gleet is very thin and in small quantities, it is the mere discharge of those ulcers. A temporary increase of a gleet is not wonderful, because habitual ulcers of every other part of the body are often in a fluctuating state, and generally suffer from excesses of every kind.

Astruc, in this disorder, recommends milk, either of asses, goats, or cows, to be drank morning and evening for some time; then mineral waters, whether chalybeate or vitriolic, for 15 or 20 days; and afterwards balsamics, to deterge and cicatrise the ulcers concealed in the urethra, such as balsam of capivi, from 6 to 12 drops, made into a bolus with powder-sugar; last of all, astringents to dry up the ulcers, and to recover the lost tone of the parts, such as infusions of the leaves of mint, horehound, agrimony, plantain, red roses, shepherd's purse, sage, *&c.* or the mint-water of Quercetan, so often recommended by Riverius against obstinate gleets.

V. *Of* Chancres.

Astruc observes, that chancres were the *caries pudendorum* of the ancient writers, and are generally seated on those parts which have a fine and tender covering, through which the virulent sanies, issuing from the exulcerated genitals of either sex, has the easier admittance. Such are the inward duplicature of the prepuce, the inside of the pudenda in women, the nipples of nurses, the lips and tongue of prostitutes. In very bad cases they will appear on the dorsum penis, as well as on the pubes and inside of the thighs.

In the cure of the recent chancre, he first orders bleeding, to abate the inflammation; then fomentations, to resolve the induration; not omitting mercurials in the mean time, but so as to avoid a salivation. After which he advises the use of sudorific decoctions of china, sarsaparilla, guaiacum, and sassafras boiled with antimony.

Turner formerly used red precipitate sprinkled on a proper ointment.

Of late years, he says, he always found smoaking the parts with cinnabar successful in chancrous ulcerations on the glans and præputium of men, as well as the labia and sinus pudoris of women. His method was to throw a dram of cinnabar on a heater or hot iron, letting the fume ascend through a funnel, or a seat perforated like a close-stool, all round the diseased parts. This was done every day, and sometimes twice a-day for a week. The iron was hot enough to raise flame with smoak, but not so fiery red as to make it instantly consume away in flame alone.

VI. *Of the* Phimosis, Paraphimosis, *and* Crystalline.

These are disorders proper to men, except the crystalline; but Astruc affirms, that women have something of the

the ſame nature; and even extends them to their nipples, where the ulceration conſtraining the area or circle round about them irritates the ſame. The phimoſis of women is the conſtriction of the entrance into the vagina.

He begins the cure with bleeding and gentle purgatives, ſuch as *caſſia cum manna* and *merc. dulc.* inſtead of briſker cathartics and emetics, which, as Turner thinks, by making a ſtronger revulſion, afford ſpeedier relief.

He then adviſes anodyne emollient fomentations and cataplaſms to relax and ſoften, and afterwards diſcutients to breathe forth the humours; and, if the penis is ſoaked therein an hour or two twice a-day, the effect will be more certain; but if a ſtagnation is threatened, and thence a gangrene, the prepuce is to be divided in the phimoſis on each ſide the glans, and the folds of it to be cut through in the paraphimoſis; by which the ſtrangled glans may be ſet free, and the chancre, if any, brought into view. The like muſt be done for the cryſtalline, in order to diſcharge the impriſoned lymph, and forward the ſubſidence of the prepuce, thereby inflated and puffed up.

The affected parts in women ſhould likewiſe be fomented with the like emollient and mucilaginous decoctions, of the roots of marſh-mallows, white-lily, water-lily, and the leaves of branc urſine, mallows, linſeed, *&c.* ſeveral times a-day. Afterwards, a peſſary made of linen or ſponge dipped in the emollient liquor ſhould be introduced into the vagina.

VII. *Of* Tubercles *and* Scirrhous Cords.

The tubercle is a calloſity remaining after healing the chancres of the glans, which hinders the free play of the foreſkin over the glans. If this will not yield to a ſtrong mercurial unction, the only remedy is circumciſion.

The ſcirrhous cords are tubercles which ariſe where there has been an ulceration; and may be left under the ſkin of the penis, ſometimes round, and ſometimes like a cord. They ariſe gradually, and diſappear with the help of a little mercurial unction, and a courſe of mercurial purging, unleſs complicated with other ſymptoms of a worſe kind.

VIII. *Of the* Porri, Condylomata, Chriſtæ, *and the like Excreſcences.*

The venereal porri, whoſe ſeat is the pudenda, if they are recent, ſmall, and ſoft, ſometimes dry and fall off of themſelves, after the poiſon has been deſtroyed by mercurial frictions; but if they are hard, large, and have deep roots, they will ſometimes continue after them, and grow like warts in other parts of the body. In this caſe they muſt be cut with the point of the ſciſſars as near the ſkin as poſſible, and a mercurial plaſter muſt be prepared with a large proportion of mercury, and mixed with *diach. cum gum.* to promote a ſuppuration, and to diſſolve the calloſities at the baſes of the porri, before a cicatrix is formed.

But if the baſis is hard, and ſurrounded with hard and deep calloſities, ſlight mercurial frictions muſt be uſed; and the wound muſt be dreſſed with baſilicon, ſprinkled with red precipitate, to conſume the calloſities by little and little, to ſoften the edges of the ulcers and diſpoſe them to heal. If this ſhould fail, ſtronger corroſives ſhould be uſed.

The ſame directions are applicable to the whole tribe of condylomata, chriſtæ, mora, fici, either about the pudenda or anus.

Of the Lues Venerea, *or* French Pox.

When a gonorrhœa has continued a long while, or long enough for the poiſonous matter to make its way into the blood, or, by aſtringents given unſeaſonably, it cannot make its exit, then the patient is infected with the pox.

The buboes in the groin conſtitute the firſt degree; then follow pains which cruelly torment the head and joints of the ſhoulders, arms, and ancles, coming on by fits, but at no certain intervals, unleſs in the night when the patient is warm in his bed, ſeldom leaving him till towards the morning.

There are alſo ſcabs and ſcurf in various of the body, which are as yellow as a honey-comb, and which diſtinguiſhes them from all others. Sometimes they have large ſurfaces, anſwering the deſcription which authors give of the leproſy. But the more theſe ſcabs are diſperſed over the body, the leſs he is tormented.

All theſe ſymptoms gradually increaſe, eſpecially the pain; which becomes ſo intenſe, that the patient is unable to lie in bed. Afterwards nodes or exoſtoſes ariſe in the ſkull, ſhin-bones, and bones of the arms, which, being attended with conſtant pain and inflammation, at length grow carious and putrefied.

Phagedenic ulcers likewiſe ſeize various parts of the body; but generally firſt begin with the throat, and from thence gradually creep by the palate to the cartilage of the noſe, which they deſtroy, and the noſe, being deſtitute of its prop, falls down flat.

The ulcers and pain daily increaſing, the patient ſinks under the torment; and being not able any longer to ſtruggle with ſtench, rottenneſs, and the loſs of one member after another, his mangled offenſive carcaſe is hurried into the grave.

Beſides the ſymptoms proper to the pudenda and parts adjacent, which have been already mentioned, the following are obſervable in a confirmed pox; which however do not appear in all patients, nor at the ſame time.

1. The ſkin, eſpecially about the neck and breaſt, and between the ſhoulders, is covered with flat ſpots like freckles, of a roſy, purple, yellow, or livid colour, ſometimes diſtinct, ſmall and round like lentils, ſometimes more large and extended.

It is full of itchy puſtules, tetters, and ringworms, a ſerpigo, a herpes miliaris, and exedens. There are chaps in the palms of the hands and ſoles of the feet, with itching, from whence proceeds a clear ſerous liquor, and the epidermis peels off in large flakes.

It abounds with hard, callous, round puſtules, riſing a little on the top, generally dry, but ſometimes moiſt, ſcaly, branny, and yellow; frequently on the corners of the lips, and the ſides of the noſtrils, but more eſpecially on the forehead, temples, and behind the ears, where they appear in rows like a ſtring of beads, and gradually creep among the hair.

The hair not only falls off from the head, but all parts of the body where it grows. Then the nails become unequal,

equal, thick, wrinkled, and rough; afterwards ulcers ariſe which cauſe them to fall off.

II. The inſide of the mouth, throat, and noſe, are alſo affected; the uvula and tonſils become painful, hot, inflamed, and ulcerated; puſtules appear in the roof of the mouth, which degenerate into round, malignant, phagedenic ulcers, which rot the bone as far as the noſtrils. The pituitary membrane is likewiſe liable to puſtules, which produce malignant ulcerations that infect the bones of the noſe with a caries, particularly the vomer; which being eaten away, the noſe falls down; the voice becomes hoarſe and low; the gums being covered with aphthæ, ulcerate and rot; the teeth ache, grow rotten, and fall out; and the breath is very offenſive.

III. The patient is excruciated with pains in the night-time, when in bed and covered with cloaths: theſe are either tenſive, pricking, pulſative, or rending; fixed or wandering; which ſometimes occupy the muſculous and membranous parts like the rheumatiſm, ſometimes the tendons and ligaments about the joints reſembling the gout; ſometimes they are with tumour or inflammation, ſometimes without.

IV. The bones are affected in various manners; in the middle exoſtoſes ariſe, either ſoft or hard, ſometimes with intenſe pain, ſometimes without. The heads of the bones enlarge every way, but unequally, which produces tumours, pains, difficulty of motion, and ſtiff joints. As the caries increaſes, they become brittle, and break upon the leaſt effort. Sometimes they are ſo far diſſolved, as to bend like ſoft wax.

V. When the lymph is infected, the lymphatic or conglobate glands become hard and callous, and form, in the neck, armpits, groin, and meſentery, hard, moveable, circumſcribed tumours, like the king's evil. The lymphatic veſſels are dilated, extended, and enlarged by a thick ſtagnating lymph, and form ſoft enciſted tumours or gummata: In the tendons it cauſes nodes, in the nerves ganglions, and in the ligaments of the joints tophs.

VI. Neither do the ears and eyes eſcape the fury of this diſeaſe: for the latter are externally affected with pain, redneſs, itching, and lippitude; and internally, being loaded with humours, the ſight is deſtroyed, and ſometimes a ſuppuration ſupervenes. If the vitreous humour of the eyes is thickened, it cauſes a glaucoma; if the cryſtalline, a cataract; if the aqueous, hairs or ſpiders webs ſeem to float in the air.

The ears are affected with a ſinging noiſe, hardneſs of hearing, deafneſs, and pain, whilſt their internal ſubſtance is exulcerated and rendered carious.

After this catalogue of ſymptoms, it is no wonder that all the animal, vital, and natural functions ſhould be depraved, the face be pale and livid, the body emaciated and unapt for motion, and that the patient ſhould fall into an atrophy and maraſmus.

Women have diſorders proper to the ſex; as, cancers in the breaſt, a ſuppreſſion or overflowing of the menſes, the whites, the hyſteric paſſion, an inflammation, abſceſs, ſcirrhus, gangrene, ulcer and cancer of the womb. They are either barren or ſubject to abortion; or the children they bring into the world have an univerſal eryſipelas, are half rotten, and covered with ulcers.

The methods of curing the pox are principally four: 1. The common, by ſalivation; 2. By giving quickſilver pills; 3. By mercurial frictions, which are to be purged off before a ſalivation is raiſed; 4. By ſweating, with a decoction of guaiacum.

The ſafeſt and moſt commodious method of ſalivation is by mercurius dulcis ſix times ſublimed, given inwardly in the milder pox; or by mercurial unction, when the diſeaſe is got into the bones.

Fifteen grains of mercurius dulcis may be given in a morning, and the like doſe at night, with *electar. e ſcordio.* After three, four, or five days with this management, we uſually obſerve the fauces to inflame; the inſides of the cheeks to be tumid, or high and thick, being ready to fall within the teeth, upon ſhutting the mouth; the tongue looks white and foul, the gums ſtand out, the breath ſtinks; and the whole inſide of the mouth appears ſhining, as if parboiled, and lying in furrows.

The inſide of the mouth thus beginning to be whealed, you may expect ſoon to ſee them ulcerated, eſpecially about the ſalival glands, which empty themſelves thereinto. Now it may be proper to deſiſt a day or two, to obſerve the increaſe of the ulcers, what ſloughs are like to be raiſed, and what their depth and dimenſions are like to prove; from which a near conjecture may be made of the duration as well as quantity of the ſpitting now begun, and the conſiſtence of the drilling lympha whether more or leſs fluid.

When the ſalivation is thus begun, your only buſineſs is to encourage your patient chearfully to go on. Let his diet be ſmall chicken-broth, water gruel, and panada. His drink, ſmall ſack-whey, or poſſet-drink, with a draught of good ſmall-beer with a toaſt between whiles.

Thus, after ſome days reſpite, if, after the ſpitting comes on, you find the patient hearty, his chaps but little ſwelled on the outſide, and as little ſore within, the ulcers not increaſing, with few or no ſloughs appearing therein, the flux alſo inconſiderable in quantity, you may now give a ſcruple of *merc. dulc.* in *elect. e ſcord.* at going to reſt, repeating it two or three days following, as you find occaſion, and then wait the iſſue again. This is the ſafeſt and moſt prudent method.

If he ſhould have taken half an ounce of calomel, with little alteration as to the ſwelling and ſoreneſs of his mouth, and as little appearance of his ſlavering, his pulſe and other circumſtances favouring the ſame, and no ill ſymptom appearing, you may vomit him with viij or x grains of turpeth mineral in conſerve of roſes, or mixed with x or xv grains of calomel, encouraging the operation with ſmall draughts of common poſſet-drink between whiles, upon each motion to reach, but not loading the ſtomach therewith, as is cuſtomary in other emetics. If there is occaſion, it may be repeated two or three days after, which will forward the ſalivation more effectually than more doſes of calomel ſimply repeated would have done.

If a ſalivation cannot be raiſed to any quantity, as in ſome it cannot, you muſt forbear and purge it off, and give calomel once or twice a-week, and purge it off the next day, or two days after.

When the ſpitting goes well forward, it may be left to take its courſe till it declines of itſelf; which, in pro-

portion to the ulcers and thicknefs of the floughs about the parts of the mouth, may happen at the end of twenty-one days, or a month from its rifing; that is, from the time of fpitting a pint and a half a-day, till it comes to three pints, or even five pints, in twenty-four hours, when it gradually goes off again. For often the firft four or five days, or a week, are fpent in bringing it to the firft proportion.

In the more ftubborn and rebellious pox, attended not only with cruel night pains, gummata, tophs, nodes, and alfo rotten or foul bones, if the patient has been ufed to mercurials, or if falivated before, then the cure muft be attempted with falivation by unction.

You may mix an ounce of quickfilver with three ounces of axungia; of which, an eighth part is to be ufed night and morning, letting the patient rub it in with his own hands gently by the fire, beginning with his ancles up to his fhins and knees, all round his joints, and fo to his thighs, which are prefently after to be covered with yarn-ftockings and flannel-drawers; then let him ufe what remains of his eighth part about his elbows and fhoulders, wiping his hands clean about the glands of his arm-pits, or thofe of his groin. His body, during the unctions, fhould be fkreened from the cold with a blanket hung behind him, and then be wrapt up in a warm flannel; that is, he muft have a flannel fhirt, waiftcoat and drawers, a cap, a muffler pinning it up thereto behind, and covering all his throat, chin, and cheeks before, to defend them from the cold air. The fame things are requifite in the former way. The weak need only be anointed once a-day.

If, when the ointment is divided into four parts, after the third unction the patient begins to complain of his chaps, you muft ftay a day or two before you proceed farther: The fame when gripes or bloody ftools approach.

Where there are a gummata, tophs, and nodes, the ointment muft be chafed particularly into thofe parts, and then apply the mercurial plafter upon them. If the fpitting declines too fuddenly, give a fcruple of calomel every day, or every other day, for two or three times, as you fhall fee occafion.

When he is a little recovered, and his chaps pretty well, he may eat a little chicken, veal, rabbit, or mutton, well roafted, without fauce or gravy.

The patient fhould be prepared for a falivation by a lenitive purge or two; and, if plethoric, he fhould bleed: Likewife bathing in warm water, for fome hot, lean, emaciated people, has been found ferviceable. Women fhould be laid down juft after their menftrual flux is over. Temperate-weather is the moft fuitable.

If the patient is troubled with ficknefs and vomiting; if mild, give him freely of a fmall chicken-broth, poffet-drink, or thin water-gruel, refrefhing him with a little mulled wine between whiles. But if there is a cardialgia, and intolerable pains at the mouth of the ftomach, with inceffant vomiting, fpafms of the members, fainting, cold fweats of the forehead and eyebrows, the patient is in the utmoft danger, and you muft ceafe giving mercury, and if poffible turn it downwards, by directing the common clyfter with 2 or 3 ounces of brown fugar, and as much oil-olive.

To prevent the jaws from being locked up, it is neceffary to ufe a bit of ftick covered with a foft rag, which muft be held between his backward teeth: But, if there fhould happen an adhefion of the infide of the cheek to the gum, hindering the patient from eating and opening his mouth, the fame is to be carefully divided.

If, during the falivation, a blood-veffel burfts open, make a little pellet of lint, and cover it with the fine powders of alum or vitriol, or dip it in the tinctura ftyptica, and thruft it clofe down into the cavity, which will fecure the effufion, being held tight with the finger for a little while. If it happens from the feparation of the floughs from the fide of the cheeks, a little oxycrate held in the mouth will do the bufinefs, or an aftringent decoction of oak-bark.

If the patient has been without a ftool for fome days, give an emollient clyfter of warm milk, fugar, and oil. At this time he may drink freely of fmall beer with a toaft, barley water, fmall fack-whey, or poffet-drink. For diet, water-gruel, oatmeal-caudle, fmall chicken or veal broth, a roafted pippin, or a few ftewed prunes.

If, notwithftanding your care in giving fmall dofes of mercury, the fauces fhould fuddenly inflame and tumefy, endangering a fuffocation of the patient, the moft certain relief is to bring the humours downward by fharp clyfters, and, if he can fwallow it, a cathartic by the mouth.

An ozæna, or ulcer of the noftril, is beft cured by a cinnabarine fumigation, which fubdues the malignity, dries up the ulceration, and difpofeth the caries, if any, to a feparation beyond all others; after which, and fometimes before, calomel muft be given and purged off; or, if there are other fymptoms of a profound infection, you muft falivate by unction.

The like method muft be ufed for ulcers of the palate, uvula, and tonfils. The fume rarely fails to ftop the farther erofion, and therefore it is always to be directed, though a falivation is intended. It cures, in two or three days time, the moft putrid and corrofive venereal ulcers, or after the fecond or third fmoking.

Aftruc difapproves of any other method of falivation but by frictions; and he would have pure mercury ground in a mortar, with juft fo much turpentine as will reduce it into a brown or black powder, and mix with it equal parts of frefh lard, and fo well mixt, that the particles of the mercury fhall not be vifible by a magnifying glafs. He alfo allows that occafionally there may be double the quantity of lard.

He diftinguifhes the frictions into weak and ftrong; for the ftrong he allows not lefs than two drams of the ointment, nor more than four. The firft time, the patient is to be anointed from the feet to the calves of the legs; two days after, from thence to the middle of the thigh; then the third time, as far as the buttocks. If after the feventh day there appears no fign of a falivation, you muft proceed to the fourth friction, from the buttocks along the loins and back to the neck, with a large quantity of ointment. If on the ninth day nothing appears, another friction muft be from the wrifts to the fhoulders.

During the falivation, he allows the patient, if he has ftrength, to get up fometimes, and fit by the fire; or, if he cannot, to fit up in bed: when he lies down, he would have

have him lie in as prone a posture as he can, that the saliva may be evacuated more easily, and not fall into his stomach.

In the weak or slight friction he allows from one to two ounces of the ointment. The first friction is to be only on the feet; the second on the legs; the third on the knees; the fourth on the thighs; the fifth on the buttocks and perinæum; the sixth on the loins; the seventh on the back and between the shoulders; the eighth and ninth, if there is occasion, from the arms to the wrists. There may be three, four, five, or even six or seven days between each friction, if the patient is very weak: But the rule is, to look into the patient's mouth before a new friction, that you may be certain not to bring on too plentiful a salivation. The dose of the ointment must be so managed, that, after the fourth or fifth friction, a salivation may come on that is gentle, easy, governable, without a swelling of the head; with only a few aphthæ in the mouth, or at most a few superficial ulcers, and the patient not spitting above a pint or two in twenty-four hours: and to this point it must be kept up, with a new friction, if there be occasion. Likewise it may be kept under with clysters and plentiful drinking of the ptisan; and, if necessary, with lenitive purges. This treatment may be continued, *pro re nata*, from 30 to 50 days, or longer.

Till the salivation comes on, the patient may be indulged in weak soups, rice, cream, panada's *&c.* and even milk for breakfast; but after that they must be left off; and he must drink a large quantity of ptisan to dilute the blood. He may sit up all day, if his room be warm.

If, after a due repetition of mercurial frictions, a salivation does not appear, it generally happens that a looseness, a flux of urine, copious sweats, or at least a plentiful transpiration, will supply that defect, and serve in its stead. In this case, the patient may think himself exceeding happy and fortunate, that he has obtained a complete cure by a method more certain and convenient than by salivation, and without its incommodities and dangers.

The second method of curing the pox is by a quicksilver pill. This was brought into reputation by Belloste; and though he has kept the composition a secret, yet there is no reason to doubt but it is quicksilver mixed with a certain proportion of a cathartic.

The third method of curing the pox is by mercurial frictions, which De Salt gives as follows:

When the patients have a pox of a long continuance, and the venereal poison is dispersed all over the body, they should be prepared by bathing and drinking whey. But in a recent pox the bath is not necessary, or at least need not be used long, because the blood is sufficiently diluted.

After this, instead of raising a salivation, bring on a flux of the belly; the whole secret of which consists in keeping the body open by clysters of a decoction of senna and the pulp of cassia, before the frictions are administered; by which the intestinal glands being opened, the mercury will more readily tend that way. When the looseness does not answer the number of the frictions, nor the quantity of the mercury made use off, purge the patient with powder of jalap, and procure copious stools, which secure the mouth. While the looseness is going on, the friction does the office of a purge; and in proportion as they are repeated, the flux of the belly revives; and when it slackens or stops, have recourse to the clysters and purges of jalap. Pursue this method till the symptoms cease, and till, by the abundance of the evacuations, the venereal poison is entirely drained off.

The last method is sweating with strong decoctions of guaiacum. This we have the first account of from Sir Ulrick Hutton, who pursued it himself. A pound of guaiacum is to be boiled in a gallon of spring-water to one half, and the scum reserved to anoint the sores, and a secondary decoction was to be used for common drink.

But, when salivations and other mercurial courses have failed, the best method of cure is by the root of sarsaparilla; which discovery we owe to Dr Hunter, who put Mr Fordyce, a surgeon in the army, upon making a trial of it; the result of whose experience is as follows.

1. It will commonly relieve venereal head-achs and nocturnal pains in a very short time; and, if persisted in, he believes it will always cure.

2. In emaciated and consumptive habits, from a venereal cause, it is the greatest restorer of the appetite, flesh, colour, strength, and vigour, that he knows.

3. When the throat, nose, palate, or the spungy bones in general, are affected with a slough or caries, it will commonly complete the cure, if persevered in long enough, provided a mercurial course by unction has preceded the use of the sarsaparilla.

4. When the body is covered with dry blotches or moist sores from a venereal cause, it will greatly promote the cure, nay often complete it; but, without the assistance of mercury, there will be danger of a relapse.

5. In simple chancres it will do little service; but, if it is given in cases where the chancres or buboes will not heal or dissolve after the use of the mercurial unction, it will often cure, and do always manifest service.

6. It will often answer, and that speedily, without sweating, confinement, or any strict regimen, at all seasons of the year, when mercurial unctions and long continued courses of strong decoctions of guaiacum, either by itself simply, or compounded with a small proportion of sarsaparilla, have failed.

7. It seems probable, that sarsaparilla root is the only medicine to be depended upon in venereal cases where mercury has failed, or at least has preceded the use of the decoction; for it is not to be trusted alone. When no mercure has been given, it and this decoction may be administred together, and then there will be no room to doubt of success.

8. Mercury alone will cure most venereal complaints, and sarsaparilla will perhaps always cure them when they resist the power of mercury; and therefore a proper combination of mercury and sarsaprilla will probably cure every case that is truly venereal.

The method of using it is this; to three ounces of the sarsaparilla root, which has not been spoiled with age, worms, sea-water, or moisture, add three quarts of river-water, and make it boil as speedily as possible, in an open vessel, till two pints of the strained liquor remain, that is, about two pounds avoirdupoise weight; a little liquorice-

liquorice-root added to it will make it more palatable. This quantity is enough for twenty-four hours, and may be given at two or three doſes either warm or cold. It muſt be made freſh every other day, and what is not uſed on the day it is boiled muſt be kept in a cold cellar. The patient ſhould live abſtemiouſly while he takes it, particularly with regard to wine.

There is another compendious and efficacious method of curing the lues venerea, which has formerly been attempted by the ſame medicine, but in a different manner, and not with the ſame ſucceſs.

Dr. Pringle recommended a method of curing the lues venerea, which at firſt was brought into a regular practice by baron Van Swieten. His method conſiſted in giving corroſive ſublimate in French brandy or moloſſes ſpirits. The proportion was a grain of the mercury to two ounces of the ſpirits; and his common doſe was from half an ounce to an ounce, or, which is the ſame thing, from one ſpoonful to two, twice a-day; adjuſting the quantity to the ſtrength of the patient and to the virulence of the diſeaſe. The operation was either by ſweat or urine, eſpecially when the medicine proved moſt ſucceſsful. It was continued as long as any of the ſymptoms remained, with a low, ſpare diet, plenty of barley-water, and a little milk, or ſome ſuch diluting liquor.

Of the Yaws.

The Yaws is a diſtemper endemical to Guinea and the hotter climates in Africa; but has of late ſpread by infection over many parts of Europe. All are liable to it, but more eſpecially in childhood or youth.

It makes its firſt appearance in little ſpots on the cuticle, not bigger than a pin's point, which increaſe daily, and become protuberant like pimples. Soon after, the cuticle frets off; and then, inſtead of pus or ichor, there appear white ſloughs or ſordes, under which is a ſmall red fungus. Theſe increaſe gradually, ſome to the ſize of a ſmall wood-ſtrawberry, others to that of a raſpberry, others again exceed the largeſt mulberry, which in ſhape they very much reſemble. In the mean time, the black hair in the yaws turn to a tranſparent white.

It is not an eaſy matter to determine the exact time which the yaws take in going through their different ſtadia. Luſty well-fed negroes have had ſeveral yaws as big as a mulberry in a month's time; whereas the low in fleſh, with a ſcanty allowance, have paſſed three months, without their growing to the ſize of a ſtrawberry.

The yaws appear in all parts of the body, but they are moſt plentiful and of the largeſt ſize about the groin, privy-parts, anus, arm-pits, and face. They are largeſt when feweſt in number, and *vice verſa*. They are not painful unleſs handled roughly, nor cauſe a loſs of appetite. They continue long without any ſenſible alteration; and whether they would not in time, when the peccant mattter is exhauſted through the ſkin, vaniſh of themſelves; or turn to corroſive ulcers, and affect the bones with nodes, exoſtoſes, and caries; or, by enlarging the excretory ducts of the miliary glands, cauſe a fluid totranſude more viſcid than ſweat, which by drying on the ſkin would render the patient ſcorbutic, ſcabby, or leprous; is hard to ſay. It is an infectious diſeaſe.

The yaws are not dangerous, if the cure is ſkilfully managed at a proper time; but if the patient has been once ſalivated, or has taken any quantity of mercury, and his ſkin once cleared thereby, the cure will be very difficult, if not impracticable.

The negroes who have been cured in Africa never have them again in America.

As ſoon as the yaws begin to appear on a negroe, he muſt be removed to a houſe by himſelf; or, if it is not certain whether the eruption is the yaws or not, ſhut him up ſeven days, and look on him again, as the Jews were commanded to do with their lepers, and in that time you may be commonly certain.

As ſoon as you are convinced that it is the yaws,

Take a ſcruple of flowers of ſulphur; five grains of camphorated ſpirit of wine; a dram of Andromachus's treacle; and a ſufficient quantity of ſyrup of ſaffron. Make them into a bolus, to be taken at bed-time.

Repeat this bolus every night for a fortnight or three weeks, or till the yaws come to the height; that is, when they neither increaſe in ſize or number: Then throw your patient into a gentle ſalivation with calomel given in ſmall doſes, without farther preparation; five grains repeated once, twice, or thrice a-day, is ſufficient, as the patient can bear it. If he ſpits a quart in twenty-four hours, it is enough. Generally, when the ſalivation is at this height, all the yaws are covered with a dry ſcaly cruſt, or ſcab; which, if numerous, look terribly. Theſe fall off daily in ſmall white ſcales, and in ten or twelve days leave the ſkin ſmooth and clean. Then the calomel may be omitted, and the ſalivation permitted to go off of itſelf. A dram of corroſive ſublimate diſſolved in an ounce of rum or brandy, and the ſolution daubed on the yaws, will clear the ſkin in two days time. After the ſalivation, ſweat the patient twice or thrice.

He may likewiſe drink the decoction of guaiacum and ſaſſafras fermented with moloſſes, for his conſtant drink.

Sometimes there remains one large yaw, high and knobbed, red and moiſt; this is called the maſter-yaw. This muſt be conſumed an eighth or a tenth part of an inch below the ſkin, with equal parts of corroſive mercury and burnt alum, and digeſted with an ounce of yellow baſilicon and a dram of corroſive mercury, and cicatrized with lint preſſed out of ſpirits of wine, and with the vitriol ſtone.

To children under ſix or ſeven years old, at the proper time of ſalivating, [when the yaws are come to their full growth,] give a grain or two of calomel in white ſugar, once a-day, one in two days, or once in three days, ſo as only to keep their mouths a little ſore till the yaws dry, and, falling off in white ſcales, leave the ſkin clean. This ſucceeds always, but requires a longer time than in adults.

The venereal diſeaſe and the yaws ſeem to be very diſtinct diſtempers; but the ſymptoms, in conſequence of the yaws ill cured, coincide ſo exactly with the ſymptoms of an inveterate French pox, that in moſt caſes it will be very difficult if not impoſſible to diſtinguiſh them.

Of the Scrophula, *or* King's Evil.

The King's evil is attended with hard, ſcirrhous, and often

often indolent tumours, which arise by degrees in the glands of the neck, under the chin, armpits, groin, hams, arms, and wrists; but it is most commonly seated in the neck, and beneath the ears.

Likewise cold tumours, which appear on the joints and bones, as on the knees, elbows, hands, and feet, but more particularly on the fingers, are disorders of the scrophulous kind: as also the greatest part of those obstinate fluxions, which fall gradually on the joints, without a manifest cause; and which are attended with an abscess, a caries, and swelling of the bones, called the *spina ventosa*; especially of the apophyses and epiphyses. Of the same kind are likewise the oedemata or white swellings which arise in the arms, legs, and feet, principally about the joints. They consist of a jelly or coagulated lymph, which puffs them up, but do not pit when pressed with the fingers like dropsical swellings.

In the eyes the scrophula creates inflammations; in the eye-lids a puffing up of their edges with great soreness and small ulcers; in the angles of the eye a fistula lachrymalis, by ulcerating the gland planted there for the percolation of tears; in the lips, excessive and preternatural thickness; in the nose it often creates the crusty ulcer called ozæna. All which, except the last, are often the forerunners of this disease, antecedent to the great swellings and foul ulcers which appear in its maturer state.

The glands of the external parts are not alone attacked with this disease; for those of the mesentery are almost always affected; which appears from the opening of persons dying of this disease. Sometimes the disease begins in the mesentery; and sometimes the liver, spleen, womb, lungs, windpipe, brain, and other internal parts, are scrophulous: Hence scirrhous tumours, incurable cancers, obstinate fluxions, rebellious ophthalmies, malignant abscesses, fistulous ulcers, dangerous quinseys, terrible epilepsies, mortal consumptions of the lungs, stubborn jaundices, dropsies, cholics, hypochondriac and hysteric affections.

The scrophulæ are hard tumours, because they are produced by a thick coagulated matter; they are cold, because they are caused by a stagnation of the lympha in the part affected.

The scrophulæ may be said to be benign, when they are superficial; when they do not much raise the skin, nor change its colour; when only the glands are puffed up, and are soft, moveable, without adhesion and indolent.

The malignant scrophulæ are evident from the largeness of the tumour, its hardness and adhesion; from its becoming livid or red; from its being painful; and, when ulcerated, from the callosity of the lips of the ulcer, and from their difficult cure.

As to the prognostics; the benign scrophulæ admit of an easy cure, especially if they are seated in the conglobate glands, and are moveable, superficial, and soft. Those which attack the joints, the tendons, the ligaments, the bones, which are near large vessels, or compress the aspera arteria, or the oesaphagus, are very difficult to cure. The internal scrophulæ are much more dangerous than the external; for when they turn to an abscess, they are incurable. They are also more or less troublesome in proportion to the progress they have made, the parts which they attack, and the temperament of the patient. If the strumæ have been long ulcerated, and are become sinous and virulent, and if they lie near one another, they often find a communication, though they appear distinct: In this case the lips grow callous, and the ulcers corrosive, frequently sordid; and the cure is not to be expected as long as one cystis remains of the vessels that feed them. Those who are seized with strumæ in the neck after forty years of age, seldom recover.

If strumous tumours arise from a caries in the bones of the fingers or hands, the cure is difficult; but more so in the feet and toes. If in the os calcis, joint of the ancle, or astragalus, or in the knee-bones, or ischia, or the like, where they cannot be safely laid open, the case is deplorable, and the patient generally dies of a marasmus.

In the cure, the diet should be thin and attenuating, light and easy of digestion; and all salt and smoke-dried meat should be carefully avoided; as also beef, pork, fish, hare, cheese, and in general all things that are hard of digestion, or which yield indifferent nourishment. The air should be pure, sweet, and dry; and the body should be kept always open.

The cure may be begun by bleeding, especially if the patient is plethoric, and then a mercurial or antimonial vomit; after which he should take a gentle purge, often repeated, such as the common purging potion of Sydenham; and, as almost all remedies which are good in venereal cases are useful in this, mercurial vomits and purgatives will be proper.

Some give ethiops mineral alone for three months; beginning with twelve grains, and increasing the dose gradually to a scruple, or half a dram, and decreasing in the same manner.

It is certain that the united force of mercurials and antimonials will do wonders in these cases, if prudently given and long continued; always beginning with small doses at first.

Some make use of the decoction of sponge; the dose is four ounces: others, burnt or calcined sponge; the dose is half a dram morning and evening. Turner mentions a cure from an electuary made of the most gritty and sabulous sponges that could be got, which were dried in an oven so much as to be fit to pulverize. The dose was a spoonful night and morning.

Others recommend the absorbent powders and diaphoretic antimony; others again, tincture of antimony in a glass of the decoction of the woods; Dr Francis Fuller, the decoction of colts-foot used for a long time. Fallopius praises the root of butchers-broom; the dose is a dram with x. gr. of the root of common flower-de-luce. *Arn. de Villanova* looks on the root of scrophularia or figwort as a specific; the dose is a scruple in powder. And Allen mentions two cures performed by white archangle, boiled in milk, which it coagulates; the whey of which must be drank, and the curd applied to the sores. Of late the mineral waters of Moffat in Annandale have been drank with great advantage.

Epsom salt dissolved in a pint of water in such a quantity as to keep the body open, and taken like sea water, has often cured this disease.

After all, we have another medicine whose virtues in curing this disease have been lately celebrated, *viz.* the jesuits bark.

1. Take of the best rhubarb, half an ounce; of florentine

rentine orris, an ounce; of dried red roses, a dram and a half. Infuse these, after they have been cut and bruised, in two quarts of small ale; and let the patient drink a glass of the colature twice a-day, with the quantity of a nutmeg of the following electuary:

2. Take of the powder of the Peruvian bark, six drams; of sassafras bark in powder, two ounces. Make them into an electuary with a sufficient quantity of the syrup of sugar.

Dr Fothergill has likewise long given the bark in scrophulous disorders, and affirms that it may not only be given with safety, but to manifest advantage in many of these cases.

He gives the bark in a liquid form, in the following manner:

3. Take of Peruvian bark in powder, an ounce; and boil it in a quart of pure water to a pint. Towards the end, add of sliced liquorice-root half an ounce. To the colature add of nutmeg-water two ounces, and mix them. The dose is two, three, or four spoonfuls, with ten, twenty, to forty drops of the volatile tincture of guaiacum, twice or thrice in a day.

A small quantity of winter's bark, added to this medicine, gives it a grateful warmth, and renders a quantity of the compound water less necessary; and a little liquorice, a few raisins, gum arabic, or the like, added to the decoction before it is taken off the fire, by making the liquor viscid, enables it to suspend more of the fine particles of the bark, and at the same time renders it less disagreeable.

The swellings of the joints, commonly called white-swellings, are of the strumous kind, and of two sorts: they are both made by congestion, and increase gradually; the one arises externally upon the tendons, and between them and the skin, or between them and the bone; the other internally, within the bone itself.

That which arises externally affects the ligaments and tendons first; and sometimes relaxes them to such a degree, that the heads of the joints frequently separate one from another, and the member wastes away and grows useless. But most commonly the humours, by overmoistening the ligaments and tendons, produce a weakness and uneasiness in the joints, raising a tumour externally, and, in its progress, the membranes and bones are corroded by the humour. It will be more certain that the tumour is the offspring of the king's evil, if there are strumous symptoms in any other part of the body

In order to the cure, in the beginning of the fluxion, apply astringent and drying plasters of red lead and bole, with moderate bandage, and place the member in such a position as may prevent the descent of the humours. The internal remedies may be the same as in the general cure. Cheyne and Allen say, water pumped on the tumour is a certain remedy.

Of the Cancer.

A Cancer is a hard, round, unequal, painful, and generally immoveable tumour, of a livid, blackish, or leaden colour, surrounded with swelled, crooked, varicous vessels, in some sort resembling the feet of a crab, from whence this tumour takes its name.

A cancer is either occult or manifest. An occult begins at first with a small and almost indolent tumour, about the size of a pea, or a hazle-nut, which does not change the colour of the skin, and sometimes lies dormant for several years without making any progress.

But as soon as the virulent humour begins to become more active, the small tubercle becomes all of a sudden a large, round, livid tumour, with an unequal superficies. It is generally attended with an intense shooting pain. At length it begins to eat and break through the skin, and so becomes a manifest or ulcerated cancer, from whence proceeds a sordid, viscid, bloody, sanious or ichorous matter, attended with an insupportable stench

Though a cancer may infest any part of the body, it generally appears in the breasts, armpits, behind the ears, in the lips, nose, and private parts: women are more subject to them than men. Its general seat is the glands, and is a-kin to a scirrhus.

An occult cancer is known to be formed, when, after the signs of a preceeding scirrhus, a titillation, itching, heat, redness, are gradually perceived, with a shooting, burning, pricking pain. The colour of the skin likewise changes from a carnation to a deep red; then it becomes purple, blueish, livid, and at length black: The part feels very hard, unequal, and rough; then it rises with an apex in the middle; the swelling increases, and the adjacent veins become tumid, knotty, varicous, thick, and black.

When it begins to break, the skin is excoriated, and there transudes through it a thin sharp ichor.

After this the sound vessels on the edges of the cancer, being distended by the rising of the tumour, are broken; hence arises a putrefaction, which turns into a subtil, sharp, fetid, cadaverous sanies, which, corroding and eating away the sound parts, makes a progress in depth as well as in circumference, and sends forth malignant roots, by which it takes fast hold; the lips become tumid, parched, and offensive to the sight; the pain is intolerable, with a sense of burning, pricking, and gnawing; the colour becomes cineritious, livid and black. Afterwards arise occult cancers communicating with the glands; hæmorrhages; convulsions; a slow fever; a general wasting; loss of smell; callous tubercles in the ears without pain; fainting fits. The parts being thus eaten away and consumed, death ensues.

In persons of a good habit, an occult cancer may be pretty easily borne; but if it be disturbed, the preceding ravage must be expected.

A small, incipient, free cancer, seated in a suitable place, not joining to large vessels, arising from an external cause, in a juvenile, sound body, and being the only one in the body, should be extirpated without delay.

Outward applications of all kinds, except the plumbeous and narcotic, are to be shunned, because they have a tendency to ulcerate an occult cancer.

If the cancer be large, old, adherent, in a place unapt for extirpation, growing to or lying upon large vessels arising

arising from an internal cause; and the patient being old, disposed to these kind of disorders, and having more than one; neither excision nor topics are proper.

For unless it be extirpated, root, branch, and seed, it will be exasperated, and strike inwards, generate others, and increase those already formed.

The cause of a cancer must be taken away with it, or before an attempt of that kind is made.

A cancer of the fauces, palate, armpits, or groin, is incurable; of the lips is hard to cure.

When a cancer is large, *&c.* as above-mentioned, all we can do is to leave it at rest, and to appease the symptoms.

The first point is obtained by defending it from external injuries, by applications consisting of plumbeous ingredients and narcotics; by diminishing and correcting the cause. For this purpose cathartics with mercurials in a small, and sometimes in a double dose, will be proper; as also diluents, aperients, and subalkalious remedies; taking care not in any manner to increase the cause.

When the cancer is ulcerated, if it cannot be taken off, it should be kept as clean as possible, and be appeased with the most soft saturnine applications.

Mr Gataker has found, that the solanum hortense, as well as the lethal, otherwise called belladonna, has had surprising effects in the cure of obstinate pains, ulcers without malignity, scorbutic eruptions, and even cancerous ulcers of the face, and scrophulous sores on the thighs. Junker affirms belladonna has cured a most deplorable cancer of the breast. The dose of either is a grain or two at night going to bed, which sometimes makes the patient giddy at first. Three will often vomit, sweat, or purge the patient moderately. Boiling water must be poured upon the herb, which must be afterwards squeezed out.

Of the Elephantiasis, *or* Leprosy *of the* Arabians.

The leprosy is said to be of two kiuds; that of the Greeks, and that of the Arabians. The latter is called elephantiasis, from the roughness, inequalities, and tubercles in the skin, resembling that of an elephant. Lucretius supposed it to be generated in Egypt, and no where else; but if the leprosy of the Jews is the same as that of the negroes, which is highly probable, then we may affirm that it is endemical to the southern and inland parts of Africa.

That it was contagious, all histories agree, as well sacred as profane; and the Persians would not let a leprous person come within the city-walls.

Pliny informs us, that the first appearance of the elephantiasis is in the face, particularly a small speck appears on the nose or nostril; and, as the disease increases, the whole body is full of spots of various colours; the skin is thick in one place, and thin in another, hard and rough, with scabs. In process of time, the skin turns black, and the disease eats away the flesh to the very bones. Celsus observes, that the spots grow tumid and red, and then turn black, and the skin is covered, as it were, with scales. Then the body falls away, the mouth, legs, and feet swell, and the fingers and toes are hid with a swelling; even the bones themselves do not escape; afterwards a fever arises, to which the patient falls an easy victim.

But to set this matter in a still clearer light, it will be necessary to add the description of this disease from *Guido de Chaulias*. The leprosy, says he, commonly begins in the face and forehead, in which filthy tubercles make their appearance, and by degrees spread all over the body. The eyebrows swell; the nostrils grow wider outwardly, and straiter inwardly; the lips are disfigured with an unsightly tumour; the voice is hoarse and snuffling; the ears are turned back; the forehead is protuberant; the face is of a purple colour; the veins under the tongue are varicous and black; the muscles between the fore-finger and the thumb are eaten away; the hair falls off from the head and eyebrows; afterwards the skin of the whole body becomes black and full of spots, rough and unequal, with crusty scabs full of knobs and fissures, of horrible aspect, which makes it appear like the skin of an elephant. After this, the fingers and toes begin to swell; and then the legs, which, being covered with rugged inequalities, seem like two sacks for magnitude. Besides all this, the patient is insatiable with regard to venereal pleasures. The blood is fetid, spotted and black, and will not coagulate.

This disease is hereditary and infectious: for it may be caught by the saliva of a leper, if a sound person drinks after him; by touch; by lying in the same bed; and by coition.

An inveterate leprosy was judged to be absolutely incurable. But Aretæus says, when the disease is new and recent, there are hopes of a cure. What he and Celsus prescribe in order to the cure, are not worth repeating; for, if any medicines will do, they must be of the Herculean kind. Authors are excessive in the praise of viper's flesh, which Hoffman judges to be quite insignificant. Joel advises bleeding and purging, with xij grains of the extract of black hellebore, or iij gr. of the glass of antimony in conserve of roses; but the vitrum ceratum is more safe, and may be given in a larger dose. Towne confesses, that antimonial preparations yielded most relief in Barbadoes; but he could not say that they perfected the cure. On the other hand, mercury exasperated the distemper, irritated the ulcers, and made them spread the faster.

Of the Impetigo, *or* Leprosy *of the* Greeks.

This distemper begins with red pimples or pustules breaking out in various parts of the body; sometimes they appear single; sometimes a great number arise together, especially on the arms and legs: as the disease increases, fresh pimples appear, which joining the former make a sort of clusters, all which enlarge their borders and spread in an orbicular form. The superficies of these pustules are rough, whitish, and scaly: when they are scratched, the scales fall off; upon which a thin ichor oozes out, which soon dries and hardens into a scaly crust.

These clusters of pustules are, at first, small and few, that is, three or four in an arm, or leg only, and of the size of a silver penny. But, if the disease is suffered to increase, they become more numerous, and the clusters enlarge their circumference to the bigness of a crown-piece, but not exactly round. Afterwards it gradually increases in such a manner that the whole body is covered with a leprous scurf.

Willis

Willis blames all dried and salted meats, especially hog's flesh; and fish, particularly shell-fish, because the poor people in Cornwal, inhabiting near the sea coast, were formerly much subject to leprous diseases, and had many hospitals erected on that account.

In the method of cure, says Hoffman, we should endeavour to discharge out of the body the mass of corrupt, glutinous, and acrid humours, by sufficient bleeding and abstinence, and by purges, as well gentle as drastic; then, by proper aliment and a good regimen, promote the generation of wholsome juices; and, likewise by external, detersive, consolidating, and drying remedies, to free the parts from pains, tumours, itching, and ulcers.

The purges may consist of the root and the resin of jalap, the extract of black hellebore, elaterium mixed with calomel, or ethiops mineral, and gum ammoniac.

Among those things which stimulate the solid parts to an excretory motion, and more powerfully melt down the tenacious humours, the lignum and cortex guaiac. exceed all others, as they will generally alone cure the lues venerea. The most considerable, besides these, are the tartarized and acrid tincture of antimony, sulphur of antimony, cinnabar, and, if a venereal taint is suspected, a decoction of crude antimony. Which medicines, in a convenient dose, in the morning, with purifying decoctions drank in bed, afford very great relief.

But, if these fail, recourse must be had to mercury, which some, after extinction, mix with flowers of sulphur and camphor, and rub it on the joints to promote a salivation: others more properly give mercurius dulcis, with double the quantity of crabs-eyes and calx of antimony, rising gradually from three or four grains to a scruple, in order to salivate; with the usual precautions. The cure may also be performed with alterative and diaphoretic preparations of mercury, such as mercurius solaris and jovialis; of which a few grains may be exhibited every morning in conserve of roses for some weeks, drinking in bed after it a pint of some proper decoction.

But it must be observed, that each of these methods of cure requires an air very temperate, a spare thin diet, and an abstinence from fat, and boiled flesh, and acids.

Of the Itch.

The itch is a cutaneous disease, arising from a corruption of a serous lymphatic matter, sometimes attended with mild, sometimes with more obstinate and dangerous symptoms. The itch of the milder sort appears either with moist or dry pustules, at first about the joints, and from thence spreads by degrees over all the body, the head only excepted. In the moist sort, to which children and the sanguineo-phlegmatic are most subject, the pustules are more full of a purulent matter, attended with a slight inflammation, which is manifest from the redness which appears round about them till it suppurates. The dry sort chiefly attacks those that are lean, old, or are of a melancholico-choleric constitution: In these, the pustules are much less, and excite a most intolerable itching, especially in the night-time. The most usual places where the eruptions appear very numerous, and the itching is greatest, are between the fingers, on the arms, hams, and thighs.

This disease is, truly and properly speaking, a disease of the skin; because it often is safely cured by topics alone, if timely applied. It is contagious, and may be caught by drawing on a glove or stocking, wiping on the linen, or lying in sheets after persons infected with this malady. Some think it owing to an impurity in the serum, and some to animalculæ. But however that be, it often affects such who have been long kept in prison, who lead inactive lives, and are used to live in a sluttish nasty manner, or who constantly eat fish or flesh dried in the smoak or sun, and use any other unwholesome food or drinks; or who live in a cold, moist, aud cloudy air, which, hindering a free perspiration, causes a stagnation of humours in the superficies of the body, which are for that reason liable to corrupt.

The milder sort of itch is no way dangerous, and very easy to cure; but the moist more easy than the dry. While it is recent and superficial, it much sooner yields to remedies, than when it is deep, and has infected the mass of blood; and the case is still worse, if there be any fault in the viscera: it is more difficult in old persons than young; in a leuco-phlegmatic or hydropical disposition, as also in a very dry hectic one, it is hard to cure; and, when it becomes universal, it may bring on the leprosy.

The patient should avoid shell-fish, and all salted and high seasoned meats; as also wine, spiritous liquors, strong beer, and every thing else that may inflame the blood. For this reason a slender diet is best, unless perspiration be obstructed.

If the body is phlethoric, we are to begin by bleeding, and afterwards to pursue it by purging, which cannot safely be omitted.

Instead of repeating purging, it is common to give flowers of sulphur in milk, or treacle, with good success.

Willis and many others have a great opinion of the efficacy of sulphur used both internally and externally; to which Turner assents, except in hectic and consumptive cases. But Shaw thinks it is not to be depended on when outwardly used. Yet it is very certain that poor people find a great deal of benefit who drink it inwardly with milk, and use it outwardly with butter, or hog's-lard.

Turner prefers the salt of tartar to most other remedies, it thoroughly purging and cleansing the blood taken inwardly, and, made into a lixivium with spring water, is an excellent wash outwardly.

When the blood is thought to be foul, it will be proper to use diet-drinks, through the whole course, of the roots of china, sarsaparilla, oxylapathum, scorzonera, chichoreum, glycyrrhiza, polypodium, the barks of sassafras, cinnamomum, the shavings of the woods of sassafras, and the like; which will strengthen the solid parts, and dry up superfluous humidities.

It has been a very common practice to cure the itch by quicksilver girdles; but Turner thinks them too hazardous to be brought into regular practice, and Shaw seems to be of the same opinion.

But after all this, if the disease should prove so stubborn as not to give way to the most powerful of the preceding methods, recourse must be had to salivation as the dernier resort, which will prove effectual when every thing else fails; which, however, is not to be made use of till

the case is so desperate as to render it absolutely necessary.

Of Hæmorrhages *in general.*

The blood, which flows spontaneously, generally proceeds from those places which are of a fine and thin texture, in whose surface the slender vessels creep along with various meanders; such as the inward part of the nostrils, the bronchia of the lungs, the flesh of the gums, the left side of the stomach, the gut ilium, and the extremities of the rectum, as also the external substance of the womb and vagina. When these parts are distended, and the small arteries open, the blood often breaks out with violence.

Sometimes, though but seldom, hæmorrhages happen in other places where the vessels lie deeper; as from the little finger, from the hand and knee, the breasts in the time of menstruation. There are likewise instances of periodical fluxes from the penis in men.

They generally happen to persons whose bodies are of a soft, spongy, tender texture, and whose vessels are turgid with blood and serum. These were formerly said to be of a sanguine constitution, and are subject to hæmorrhages as long as they live. But the choleric, who have larger vessels, whose fibres are more strongly braced, and whose blood circulates with greater rapidity, are liable to a spitting of blood in their youth. The sanguineo-melancholic are subject to the bleeding piles; and women who are sanguineo-phlegmatic, are obnoxious to vomiting blood.

Boys and youths are most subject to bleed at the nose; in young men the blood seeks an exit from the lungs, whence hæmoptoes and consumptions; the middle-aged are more liable to hæmorrhoidal evacuations, and decrepid old men to pissing of blood.

Hæmorrhages are most frequent at the spring and fall; hence sanguineous apoplexies at those seasons, which are nothing else but eruptions of the blood in the middle of the brain. Vomiting and pissing of blood are more frequent in the autumn. In some, these excretions happen periodically.

When hæmorrhages proceed from a fulness of the vessels, they conduce to the preservation of health; but when they are caused by a poisonous acrid matter, as in malignant and spotted fevers, they are exceeding dangerous. Also when they are derived from an infarction, induration, and corruption of the viscera, especially of the liver, spleen, or lungs, they are generally fatal, because they bring on a cachexy, dropsy, the black disease of Hippocrates, and a mortal hectic.

Of Bleeding *at the* Nose.

A Hæmorrhage at the nose is owing to the more plentiful appulse of blood to the nostrils by a strange motion of the heart, whereby the small arteries in the pituitary coat become turgid, and too much distended, till at length they gape, and the blood rushes out.

A bleeding of the nose may be promoted when persons of sedentary lives that indulge their appetites, and so become plethoric, put their blood into extraordinary agitation by violent passions and exercise, by spirituous liquors, spices, heating volatile medicines, hot baths, or suddenly chilling their feet.

Likewise the sudden change of air from hot to cold, and cold to hot, by fits, especially at the equinoxes, may cause this bleeding; as also when from cold and moist the air becomes highly elastic, and *vice versa.* Those, moreover, are liable to it who are afflicted with rheumatic, nephritic, arthritic, and ischiadic pains, or who have fevers or spasms. It sometimes happens before the eruptions of the small pox and measles; and to those who have lost a large limb, or who labour under obstructions of the liver and spleen; hence, in an inveterate scurvy, dropsy, and cachexy, there often happens a fatal hæmorrhage.

It differs much as to the quantity; some lose only a few drops, some several ounces, and some five or six pounds. No hæmorrhage is more apt to return; which it does to some in a few days, to others in a few hours.

To the plethoric it is generally salutary; and there are many instances of a vertigo, a scotomia, dull heavy pains of the head, a phrenzy, and even an epilepsy, being carried off by a bleeding at the nose. On the contrary, from its suppression there have arisen vertigoes, apoplexies, epilepsies, convulsions, noise in the ears, and hardness of hearing, and even a gutta serena.

These hæmorrhages are critical and salutary in a synochus on a semicritical day, that is, between the third and fourth, or on a critical day, *viz.* the seventh: for, as these fevers are generally caused by a plethora, they are carried off that way.

But enormous and long-continued bleedings at the nose, when they arise from spasms of the internal parts, and are preceded with coldness of the extreme parts, and fainting fits, generally terminate in death.

After a revulsion by bleeding, there is nothing equal to nitre to appease the orgasm of the blood, and to relax the spastic stricture. Next to these are vegetable acids; such as the juice of Seville oranges, barberries, the water and juice of wood-sorrel; but more especially the diluted spirit of vitriol, tincture of roses, made with the water of wood-sorrel and the spirit of vitriol, and drank with spring-water. [Five or six spoonfuls of the common tincture of roses may be given at a time, and repeated as occasion requires.]

If the bleeding is very inordinate, it will be proper to use cooling emulsions, gentle or stronger opiates to moderate the spastic strictures, as occasion shall require. Camphor, mixed with nitre and calx of antimony, will be highly necessary, if the matter of exanthemata or cutaneous eruptions is the cause of the hæmorrhage, as is often the case.

A revulsion may be made from the head, by bleeding in the lower parts; then by temperate pediluvia, and putting the hands into warm water.

As there is often an acrid bilious matter lodged in the hypochondria, the parent of wind and spasms, the powder of rhubarb will be proper, mixt with a few grains of tartar-vitriolate and nitre; as also emollient and carminative clysters, with a due proportion of oil.

Externally, refrigerants may be mixed with discutients, and applied to the forehead, nose, and neck.

But

But it muſt be noted, that, when the patient is plethoric, the bleeding muſt not be ſtopped haſtily, if at all; nor when the menſes in women have been ſuppreſſed, or the lochia, or the bleeding piles in men accuſtomed thereto; much leſs muſt a ſtoppage be attempted when the bleeding itſelf is periodical.

In perſons of a bilious conſtitution, cold water alone, drank freely, has had a good effect.

The cachectic ſhould perſiſt long in the taking of rhubarb, either alone, or mixed with digeſtive ſalts, ſuch as tartar-vitriolate. If there is any ſcorbutic diſorder in the viſcera, beſides rhubarb, the patient ſhould drink plentifully of whey.

If any diſeaſe proceeds from the ceſſation of this cuſtomary hæmorrhage, it ſhould be promoted with a pen or a ſtraw thruſt into the noſe.

Some recommend the weaker ſpirit of vitriol, and would have eight or ten drops of it be given in every draught of liquor. But perhaps the beſt method of all in obſtinate hæmorrhages is that recommended by Mead in the bloody ſmall-pox; or the Peruvian bark alone will generally be ſufficient.

Of the Bleeding *and* Blind Piles.

A Flux of blood from the hæmorrhoidal veſſels is called the bleeding piles; when the veſſels only ſwell and diſcharge no blood, but are exceeding painful, they are termed the blind piles.

All copious fluxes of blood from the anus are not to be reckoned of the morbous kind. For the habit of body, ſtrength, age, and temperament, are to be conſidered. That which is enormous and exceſſive to one perſon, may be be moderate and ſalutary to another. That only is to be eſteemed pernicious, which continues too long, and enfeebles the patient; whereby digeſtion, nutrition, and other functions are hurt, and there is reaſon to fear the production of dangerous chronical diſeaſes.

An exceſſive hæmorrhoidal flux is generally preceded by a heavy preſſing pain of the back and loins; ſometimes a numbneſs of the legs and thighs; a conſtriction of the external parts, with a ſlight ſhivering, and a ſubſidence of the veſſels therein; a hard contracted pulſe; a dryneſs of the mouth and fauces; the urine diminiſhed in quantity, and moſt commonly pale; a ſenſe of weight about the anus extending to the perinæum; a weakneſs of the ſtomach; a flatulency in the lower belly; a frequent deſire to make water and to go to ſtool, with ſometimes an excluſion of white bilious mucus; the old and weak have a procidentia ani.

In this caſe, the blood is generally at firſt black and very grumous, and ſometimes comes away in large clots from the varicous veſſels; afterwards it becomes red, and at laſt ſerous: ſometimes it is pituitous, or like the white of an egg. There are inſtances of voiding a pint or a quart of blood daily; it often continues long, from twenty to thirty, or even forty days.

This flux entirely proceeds from the hæmorrhoidal veſſels. The external or blind piles ſeldom bleed, but turn to painful varices; which being opened weep a little, but will not yield much blood. But the internal piles, which are the offspring of the ſplenic branch, and are extended to the inner ſubſtance of the rectum, and as far as the ſphincter of the anus, together with the ſmall arteries derived from the lower meſaraic, not only bleed plentifully, but, when the flux is ſuppreſſed, create diſeaſes of the liver, ſpleen, pancreas, meſentery, and inteſtines.

The perſons ſubject to this diſeaſe are thoſe of a looſe, ſpongy texture, of a bulky ſize, who live high, and lead a ſedentary life; or to whom it is hereditary. Sharp purges, aloetics, high-ſeaſoned food, free drinking of ſweet wines, neglect of cuſtomary bleeding, anger, ſadneſs, hard riding, and the like, will uſher in this diſorder.

This hæmorrhage is dangerous, becauſe it decays the ſtrength, waſtes the body, and produces a ſenſe of weight in the thighs. The ſleep is laborious, and the præcordia oppreſſed; there is a rumbling in the belly, and a weak pulſe. When it continues long, the ancles ſwell, and the countenance is ghaſtly; there is a ſtraitneſs of breathing; and laſt of all it terminates in a cachexy, dropſy, or a ſlow and hectic fever.

If the patient is plethoric, bleed; and let his drink be cold water of the chalybeate kind, or whey turned with orange-juice; or juleps made with tincture of roſes, cooling waters, and ſyrup of roſes; likewiſe nitre in powder, with abſorbents and ſtrengtheners; and, to appeaſe the ſpaſms, opiates of the mildeſt kind.

If it continues long, and the flux begins to be ſerous, then give rhubarb with curants or tamarinds, or, which is much the ſame, with cream of tartar. Then gentle diaphoretics may be compounded of burnt hartſhorn, calx of antimony, wine-vinegar mixed with crab's-eyes, water of elder-flowers, ſimple alexitereal water, and diaſcordium; or hot decoctions of yarrow, veronica, *&c.* may be taken in bed, in order to ſweat; alſo half a grain of camphor, mixed with nitrous and bezoardic powders.

In the Blind Piles there is a moſt intenſe pain, eſpecially at the time of going to ſtool, and the excrements are tinged with blood. Sometimes tumours like warts lie hid in the ſphincter, or appear in the verge of the anus.

Sometimes the veins, in the blind piles, are ſo much dilated with blood as to be very painful and raiſe tubercles as large as peas, grapes, or eggs: They appear livid, and black, from the ſtagnation of a thick blood, and, when preſſed with the fingers, feel like a bladder filled with liquor. Some are ſoft and indolent; others hard, inflamed, and painful; render the patient unable to walk, ſtand, or ſit; and produce ſuch a ſpaſm in the anus as not to admit a clyſter. Sometimes they bleed, or turn to troubleſome itching ulcers, and occaſion an abſceſs or a fiſtula.

Linen dipped in warm ſpirits of wine, and emollients, are often of infinite ſervice; and, when they fail, leeches may be applied to exhauſt the blood: If they are not at hand, and the parts are inflamed, the lancet muſt be uſed; then dreſſings muſt be made with lint, with compreſſes and the T bandage. The tubercles, which are full and large, may be removed by a ligature, unleſs inflamed. Sometimes they are high in the rectum; and then a ſpeculum ani muſt be uſed; in which caſe they muſt be either ſcarified with a lancet, or divided with ſciſſars, that the thick noxious blood may be diſcharged, and the pains relieved.

Of the Immoderate Flux *of the* Menses.

The ſymptoms which attend this diſorder, are loſs of ſtrength, anxiety of the præcordia, fainting, coldneſs of the extreme parts, paleneſs, convulſions, ſuffocations; and, when it is inveterate, oedematous ſwellings of the feet, a cachexy, dropſy, the fluor albus, a hectic fever, and an atrophy.

Sometimes the flux returns twice in a month; and at others continues ſeveral days longer than uſual. It comes ſometimes before and ſometimes after abortion. Sometimes florid blood ruſhes out with impetuoſity, moſt frequently before a miſcarriage, and after it from a retention of part of the after birth, which keeps the orifices of the veſſels open. Sometimes clots of blood come away of the ſize of an egg, when the menſes have been ſtopped for two or three months. A black, grumous, coagulated blood will now and then come away on the firſt days of child bed, when the patient is ſlender and plethoric. In the cachectic, the flux will be often thin and watery; in the ſcorbutic corrupt and fetid, attended with ſharpneſs and pain.

It is ſometimes cauſed by a great afflux of blood to the uterus, which is not returned in due quantity by the veins; for which reaſon the veſſels often burſt. The ſame happens from a plethora, and from hard labour. About the fiftieth year, when the menſes ceaſe ſpontaneouſly, a great and ſometimes dangerous flux will happen, and then quite diſappears. If it ſhould ſuddenly and unexpectedly return about ſixty, with flooding, it brings on a fatal hectic fever.

This diſeaſe is generally preceded and accompanied with a tenſion and inflation of the hypochondria; a heavy, preſſing pain about the loins, with a chilneſs; as alſo a coldneſs of the extreme parts, a ſubſidence of the veſſels, a paleneſs, a quick pulſe, an inward heat, a coſtiveneſs, and little urine.

If a child-bed woman is not ſufficiently cleanſed at her lying-in, a great hæmorrhage will follow ſome months after, with fainting fits, and will not terminate till the excretion of a carnous maſs as big as one's fiſt, which the ſex call a mole.

If the body is cacochymic, and full of depraved juices; ſcorbutic, or infected with the venereal lues; when the viſcera are unſound, and the liver, ſpleen, and meſeraic veſſels are ſtuffed with a black, thick blood; this diſeaſe is not without danger. The patient's life is greatly in danger when the child is dead before delivery, and a great flux of blood happens. It is dangerous when cauſed by a violent extraction of the after-birth; or when pieces of it are left behind, which afterwards become moles, and greatly vitiate and increaſe the menſtrual flux.

If the patient is plethoric, bleed in the arm. If there is an orgaſm in the blood, diluents, humectants, and refrigerants, will be moſt efficacious: in this caſe ſpring-water may be drank alone, or with a little nitre, or with ſpirit of vitriol and ſyrup of poppies; the ſpaſms require gentle opiates. To carry off the impure ſerum, two ounces at leaſt of manna muſt be given, with a dram of cream of tartar in an aqueous vehicle. If the flux is obſtinate, recourſe muſt be had to aſtringents.

Thomſon of Montroſe recommends an improvement of Helvetius's ſtyptic powder; which conſiſts of two parts of crude alum, and one of dragon's blood; whereas Thomſon's is equal parts of each; and the alum is to be burnt in a crucible, and the dragon's blood added to it, and afterwards powdered. Mead has three parts of burnt alum to one of dragon's blood.

He ſays he never found this medicine fail in uterine hæmorrhages, whether to correct the too frequent return of the menſes, or their too great abundance, or to ſtop the flooding of women with child, or to moderate the flux of the lochia.

The quantities which he gives are more or leſs, according to the exigencies of the patient. In violent bleedings, half a dram every hour; and three drams or half an ounce ſeldom or never fail to ſtop the flux.

Of a Hæmorrhage *from the* Urinary paſſages.

This diſorder is commonly called piſſing of blood; and is an emiſſion of blood with or without urine, from the veſſels of the kidneys or bladder, which may be either enlarged, broken, or eroded. It is more or leſs dangerous, according to the different circumſtances which attend it.

If pure blood is voided ſuddenly without interruption and without pain, we may conclude it proceeds from the kidneys. It likewiſe comes from the kidneys, if the urine is coffee-coloured or more florid, and generally precedes a fit of the gravel, but ſometimes accompanies the paſſage of a ſtone through the ureters. But if the blood is ſmall in quantity, and of a dark colour, with or without purulent matter, chiefly if it is emitted with heat and pain in the pubes, it certainly proceeds from the bladder. This is ſometimes attended with fainting, difficult breathing, a low, ſmall, and frequent pulſe, a nauſea, anxiety, and cold ſweats.

When it proceeds from the ureters, which are hurt by a large, rough ſtone, and a ſmall quantity of blood is mixed with the urine, there is a ſharp pain in the loins and ilia, and a difficulty of making water, which when made has a ſabulous ſediment, and other ſigns of a ſtone ſticking in the ureter. When the coats of the bladder are hurt by a ſtone, and a little blood follows, it is attended with a moſt acute pain and a previous ſtoppage of the urine, together with grumes and ſabulous concretions; which alſo ſometimes happens when a ſtone is firmly fixed in the kidney.

It may be occaſioned by a ſtoppage of the hæmorrhoidal flux; from violent motion of the body, eſpecially riding; from a ſtone concealed in the kidney: from an eroſion and ulcers of the bladder; from external violence; from griping pains cauſed by violent purges; from ſharp diuretics, eſpecially cantharides.

All bloody urine has ſome degree of danger; but it is moſt ſo when mixed with purulent matter.

If the patient is plethoric, or if it proceeds from the ſuppreſſion of a ſanguineous evacuation, bleeding is neceſſary; as alſo cooling nitrous draughts, and purified nitre mixed with abſorbents, with whey for a vehicle, or barley-

water, or ſmall-beer, acidulated with ſome drops of the ſpirit of vitriol. The body muſt be kept open with laxatives, as rhubarb with currants, or with cream of tartar; as alſo emollient clyſters. The relaxed veſſels muſt be agglutinated with decoctions of vulnerary herbs; ſuch as agrimony, ground-ivy, yarrow, golden-rod, and the roots of comfrey dulcified with virgin-honey, to which milk may be occaſionally added. Almond-milk is likewiſe good, eſpecially if uſed as a vehicle with bole-armeniac.

If there is an ulcer in the kidneys or bladder, medicines muſt be given that ſheathe the acrimony; ſuch as ſyrup of marſhmallows; alſo infuſions of the vulnerary herbs above mentioned; likewiſe of the bark of the roots of acacia and cherry-tree gum.

When grumous blood plugs up the paſſage of the ureters into the bladder, or the ſphincter of the bladder, and occaſions a difficulty or ſtoppage of urine, warm water drank plentifully, and baths of the ſame, are uſeful; likewiſe warm water ſhould be injected into the bladder with a ſyringe, that the ſharp humour may be diluted and the grumes diſſolved. But, if the urine ſhould be quite ſtopped with a ſpaſm, then give emulſions of the four cold ſeeds, with crab's-eyes and calx of antimony; or a powder made of ſperma ceti, crab's-eyes, and nitre. Externally, apply a bladder filled with the decoction of emollient flowers in milk to the abdomen; and keep the body open with manna, or an emollient oily clyſter.

Milk and whey are likewiſe excellent in theſe diſorders, if a dram of bole armeniac is taken in every draught.

Of the Lethargy, Carus, *and other ſleepy diſeaſes.*

The lethargy has ſome affinity to the apoplexy and palſy, and often attends them.

By ſleepy diſeaſes are meant a preternatural propenſity to ſleep, ſometimes attended with, and ſometimes without a fever: The immediate cauſe of which is a very languid and diminiſhed influx of the animal ſpirits from the cortical part of the brain into the medulla oblongata, and from thence into the nerves deſtined for ſenſe and motion.

There are ſeveral kinds of theſe diſorders, the principal of which are a coma vigil, a coma ſomnolentum, a carus, and a lethargy.

A coma vigil is known by theſe ſigns: a burning and extenſive pain in the head, attended with a ſenſe of ebullition therein; they have a ſtrong inclination to ſleep, and yet either don't ſleep at all, or, if they do, awake immediately with little relief, but have no delirium. This coma differs from the pervigilium, which is frequent in acute fevers, for in this there is no propenſity to ſleep. This diſorder is always ſymptomatic, and often attends acute, burning, and malignant fevers; as alſo an inflammation of the dura mater, and uſhers in a phrenſy.

In a coma ſomnolentum, the patients are languid, and their chief complaint is a conſtant drowſineſs. They often fall aſleep at their meals, in converſation, and in the midſt of buſineſs, and, when they are awaked, ſoon fall aſleep again. This diſorder principally ſeizes old men, who live luxuriouſly, and neglect bleeding. It is a primary diſeaſe, and without a fever.

A carus is a profound ſleep, out of which the patient cannot be rouſed by clamours, ſhaking, nor even with the pricking of a needle; or, if they are ſenſible of the pain they continue ſilent, and fall aſleep again. It is ſometimes a primary diſeaſe, and ſometimes ſymptomatic. When it is ſymptomatic, it is of three kinds: The firſt happens in acute fevers, in the beginning or increaſe; and, if the convulſions and hiccups ſupervene, it is ſoon fatal. The ſecond comes after acute fevers; and, when the patient is exceeding weak, the ſleep will continue for ſeveral days; being awaked, he will anſwer queſtions, but immediately fall aſleep again. When he recovers, he remembers nothing that he ſaid. If it happens in acute fevers, on critical days, with a ſweat, it is a good omen. The third happens a day or two before death: for, the patient's ſtrength being exhauſted, he lies deprived of ſenſe and motion, as it were in a profound ſleep, and under that expires.

A lethargy is a heavy and perpetual ſleep, with ſcarce any intervals of waking. It is attended with a ſtupidity, and ſo ſurpriſing a forgetfulneſs, that, when the patient yawns, he forgets to ſhut his mouth; or, if he takes the chamber-pot to make water, he forgets to do it, and falls aſleep.

A lethargy is attended with a fever, which is a ſymptom thereof, and is chiefly diſcovered by the frequency of the pulſe; whereas a carus is often a ſymptom or a conſequence of a fever, and is likewiſe attended with inſenſibility. It does not invade ſo ſuddenly as an apoplexy, which is attended with an abolition of all ſenſe and voluntary motion, and kills ſooner than a lethargy.

In the cure of theſe diſeaſes, three intentions ſhould chiefly be regarded; 1. To rouſe the patient from ſleep. 2. To remove the difficulty of circulation, and the ſtagnation or extravaſation of the blood or ſerum in the head. 3. To reſtore the ſtrength of the membranes and veſſels of the brain.

Thoſe remedies are efficacious in the firſt caſe, which act on the nervous parts, by inducing a tremulous and oſcillatory motion through the whole nervous ſyſtem: ſuch as powerful acids, mixed with tincture of caſtor; volatile ſalts; fetid things, as galbanum, burnt partridges feathers; cold water thrown on the head; cataplaſms made with vinegar, rue, bay-leaves, tops of ſavory, muſtard-ſeed, caſtor, and camphor, applied to the head, forehead, and temples.

The ſerous colluvies is derived from the head by ſternutatories; the beſt is ten grains of ſalt of white vitriol diſſolved in half an ounce of marjoram water, and drawn up the noſe; bliſters on the feet and neck; cupping-glaſſes, either with or without ſcarification; ſtrong frictions on the lower parts; ſtimulating clyſters, with the addition of *ſal. gem.* common ſalt, or the root of ſquills.

To remove the ſtagnation, and promote the circulation, if the veſſels are turgid with blood, venæſection is neceſſary; then gentle laxatives, and nervous medicines with diaphoretics. A powder made of ſalt of hartſhorn, ſalt of amber, cinnabar of antimony, and bezoar mineral, has very great and ſalutary effects.

A carus, eſpecially the firſt ſpecies of it, requires plentiful bleeding; and the patient muſt be rouſed by clyſters, rendered ſtimulating with the powder of ſquills; by bliſters; by putting diſtilled vinegar in the noſtrils; and

and by appeaſing the orgaſm of the fluids with cooling fixed diaphoretics and acids. The ſecond ſpecies requires but little or no aſſiſtance; and the third is incurable, at leaſt if bliſters fail.

A coma ſomnolentum is divided into ſerous and ſanguine. The firſt requires the natural ſerous evacuations to be reſtored or promoted. Gouty fits are to be invited by frictions of the feet, bliſters, relaxing applications, and warm baths. Sternutatories are of great uſe, as they diſcharge the ſerum through the noſe, and ſtimulate the nerves. When a viſcid phlegm offends the ſtomach, vomits are uſeful, with half a ſcruple or a ſcruple of powder of ſquills, or ij gr of emetic tartar, with a laxative potion.

In a ſanguine coma ſomnolentum, when the blood circulates ſlowly, or ſtagnates in the head, as in the hypochondriac or ſcorbutic, all hot ſpirituous remedies are as bad as poiſon: But bleeding, clyſters, gentle laxatives, cooling and nervous powders, are uſeful.

A red face, eyes turgid with blood, indicate bleeding. Warm baths are bad in all ſleepy diſorders; likewiſe ſaffron, poppies, and opiates of all kinds.

Of the Catalepsy.

The catalepſis is alſo called catochus, and catoche; and whoever is affected with it is in an inſtant rendered as immoveable as a ſtatue, without ſenſe, and without motion; and continues in the ſame poſture they were in at the moment they were ſeized.

The proximate cauſe of this diſeaſe is the immobility of the common ſenſory from the time of the firſt attack; therefore there is an abſolute reſt of the blood in the brain, of the glands of the brain, and of all its emiſſaries; whereby all the functions of the brain are injured, as well as thoſe that depend thereon: The muſcles only remain tenſe as in the beginning; the reſpiration and pulſe indeed continue, but they are very faint.

But Hoffman aſſerts, that the pulſe is natural, and the breathing free and eaſy; that the limbs are moveable, but remain in the ſame ſituation in which you place them. They neither hear nor ſee, though their eyes are open; nor feel, though they are pricked ever ſo much; yet, if you thruſt any thing into their mouths, they will ſwallow it: But their bodies are ſo bound, that you cannot thruſt the fineſt pipe into the anus. The colour of the face continues florid. At laſt they fetch deep ſighs, and come to themſelves, and tell wonderful things of what they have ſeen and heard during the paroxyſm; ſome declare they have enjoyed exquiſite pleaſures, or ſeen tragical ſights, or have had divine viſions, and the converſation of angels.

This diſeaſe is generally preceded by obſtinate intermitting fevers, eſpecially quartans; by a dry, melancholy, lean temperament of body; by a retenſion of the menſes, and hæmorrhoids; by great and ſudden frights; by a profound, conſtant, fixed meditation on one object, or by ſtrong fevers in perſons of a ſanguine conſtitution.

The method of cure is various, according to the different cauſes. The patient ſhould be excited with things that greatly ſtrike the ſenſes; ſuch as light, noiſe, ſtimulating things, volatile ſalts, pain, frictions, continual agitations; by cauſing an hæmorrhage of the noſe; by promoting the hæmorrhoidal or menſtrual flux; by ſternutatories and emetics; by bliſters; by iſſues; by ſetons; by a moiſtening diet.

Of the Vertigo.

A vertigo, giddineſs, or ſwimming in the head, is a diſorder in which all viſible objects ſeem to turn round, attended with ſtaggering, or danger of falling.

A giddineſs, when it is not an original diſorder in the head, is cauſed by a long turning round of the body; by looking from a high place; in ſome, by paſſing over a broad river, by riding in a coach, by ſailing in a ſhip or boat, and by drunkenneſs.

A higher degree of a vertigo is a ſcotomia, when the patient is ſeized with a ſudden dimneſs or temporary deprivation of ſight. The higheſt degree of all is, when he falls down in the fit: This borders nearly on the epilepſy.

But it may be doubted whether a ſcotomia is always a ſymptom of a vertigo, properly ſo called; becauſe it often follows great hæmorrhages, long faſting, and very hard labour.

A vertigo will ſometimes ariſe by conſent, from diſorders of the ſtomach; and, as Etmuller obſerves, often merely from faſting, and then a morſel or two of bread will drive it away.

An inveterate vertigo, beginning without any manifeſt external cauſe, foretells in young men an epilepſy, in old men an apoplexy.

The vertigo often ariſes from a congeſtion of blood in the head, when the patient is plethoric; or where any uſual evacuation of blood is ſuppreſſed, or from an omiſſion of bleeding when accuſtomed thereto. It affects ſome whoſe heads are debilitated with hard ſtudy, or whoſe ſtomachs are loaded with vitiated, eſpecially bilious, humours.

In plethoric caſes, laxatives, bleeding in the foot, pediluvia, reſolving attemperating powders, cinnabar, nitre with an infuſion of tea or betony, are proper. If from a ſuppreſſion of an uſual hæmorrhage, it is to be promoted; but, if this cannot be done, bleeding muſt be ſubſtituted.

Outwardly, camphorated ſpirit of wine alone, or mixed with ſpirit of hartſhorn, applied to the top of the head and temples, will be uſeful; or Hungary-water, or volatile ſalts, or ſpirit of lavender, may be held to the noſe. The ſame things are good when it proceeds from hard ſtudy, with moderate diet and frequent exerciſe. As alſo a glaſs or two of wine at meals, and other ſtrengtheners. But becauſe many learned men have been hurt by the external uſe of volatile and fragrant ſpirits as well as apoplectic balſams, theſe are to be tried with great caution.

If a vertigo proceeds from crudities in the ſtomach, they ſhould be prepared or diſſolved by neutral ſalts, ſuch as tartar vitriolate; and then they ſhould be evacuated by an emetic; but, if any thing forbids, by a purge. Afterwards give ſtomachics and cephalics, and adviſe a moderate uſe of wine at meals, a ſparing aromatic diet, and exerciſe of the body. Pyrmont water is excellent in this caſe.

Of the Hysteric Passion.

The hyſteric paſſion is a ſpaſmodico-convulſive affection of the nervous ſyſtem proceeding from the womb, and cauſed

caufed by the retention or corruption of the blood and lymph in its veffels; and more or lefs infefting the nervous parts of the whole body, by means of the nerves of the os facrum, the loins, and the whole fpinal marrow.

This difeafe has been very improperly confounded with the hypochondriac paffion; for a ftrangulation of the fauces, an intercepted breathing even to fuffocation, a fainting away, a lofs of voice, a profound fleep, are the true, proper, and effential figns and fymptoms of this uterine difeafe.

An hyfteric fit is generally preceded with a preffing pain in the forehead, temples, or eyes, with an effufion of tears and dimnefs of fight, a dulnefs of the mind and fenfes, and a loathing of all things. When the fit comes on, the patient is exceeding coftive, and yet has a ftrong ftimulus to difcharge her urine, which is as clear as water; the breathing is uneafy, difficult, and fhort; and a langour feizes the whole body. To thefe fucceed a pain in the loins, and a great fhivering and fhaking; the belly is hard and inflated; afterwards the navel is drawn inwards, and outwardly leaves a great pit; then they feel a fort of a globe arife from the lower part of the belly to the hypochondria and diaphragm. Soon after, the heart begins to flutter and beat, with a hard, unequal, and fometimes intermitting pulfe; the extreme parts grow cold; the fauces are ftraitened, and feem to be bound with a cord; the face is pale, the breathing exceeding difficult, the voice ceafes, the pulfe is almoft imperceptible; and there is fuch a ftricture of the belly, that no flatus can be emitted, nor no clyfter given. In fome there are convulfions of the head and limbs; others lie in a profound fleep, without fenfe or motion; others have their face and neck look red and inflamed, with a ftrong pulfe; and others again break out into immoderate laughter, and, regaining their voice, fay a great many filly things.

When they begin to come to themfelves, the pulfe, which was before weak, languid, and obfcure, becomes brifk, foft, and ftrong; heat returns to the extreme parts; the face which was pinched in and pale, begins to expand and look ruddy; the wind forces its way upwards; there is a rumbling in the belly; and at length the patients, waking, as it were, out of a profound fleep, have their voice, fenfes, and motion reftored. Yet they complain of a heavy pain in the head; a languor of the body, feet, and thighs; fome have continued in a fit fo long that they have been laid out for dead, and have been even buried.

The hyfteric paffion attacks women that are pregnant, in child-bed; widows that are full of blood, after fome grievous paffion of the mind; or maids, after a fudden fuppreffion of the menftrual flux. It likewife oftentimes comes on fo fuddenly, violently, and at unawares, that being deprived of all fenfe and motion, they immediately fall down.

This difeafe may be caufed by whatever promotes a more plentiful and rapid afflux of blood and the genital fluid to the uterine parts, or impedes the eruption of the menfes, or occafions their fuppreffion: hence maids and widows are moft fubject thereto; alfo women of a fanguine or bilious conftitution who live high, drink generous wines, feed on high-feafoned aliment, and are fubject to violent paffions and commotions of the body and mind. On the other hand, thofe who live a fedentary life, feed on coarfe, acid, low diet, who have omitted ufual bleeding, who are oppreffed with forrows, cares, and difappointments, are liable to this difeafe; for by thefe the blood is thickened, the folid parts weakened, and confequently the flowing of the menfes rendered more difficult. Likewife fudden terror, and the body being expofed to uncommon cold during the time of the menftrual flux, by giving it a check procure hyfteric fpafms.

However dreadful and cruel this difeafe may appear, yet it is not very dangerous in itfelf, unlefs ill managed, or the patient be exceeding weak and valetudinary: it is moft apt to turn into convulfions and an epilepfy. When it proceeds from abortion, or hard labour, it is very liable to return from any flight irritation of the nervous fyftem. Nor is it very uncommon for the hypochondriac and hyfteric diforders to be united, and then the cure is very difficult. This happens to women who lead a fedentary life, indulge extravagant affections of the mind, and are guilty of errors in diet and regimen.

In the cure, it muft be carefully obferved whether the woman is plethoric, or exhaufted of blood and ftrength. In the former cafe, the fpafms or convulfions are more violent, and copious bleeding is a prefent help; and many have been brought to themfelves who were feemingly dead, if the florid colour of their faces had not fhewn the contrary.

In the fit, it will be proper to apply fetid things to the nofe; fuch as *afa-fœtida*, preparations of caftor, partridges feathers burnt, *&c.* For women in childbed, a girdle made of Ruffia leather, and bound pretty tight, is excellent. Likewife clyfters made with roots and feeds of lovage, which are fpecifics, camomile flowers, elder-flowers, veronica, the carminative feeds boiled; to which may be added oil of elder, dill, or camomile.

Externally, plafters made of opoponax, bdellium, galbanum, fagapenum, and afa-fetida, may be applied to the navel; or,

Some greatly commend fumigations for the uterus of mufk, civet, ftorax, and benjamin.

Inwardly, the patient may take 30 or 40 drops of tincture of caftor in cold water.

Some hyfterical diforders obferve the lunar phafes, and partake of the nature of an epilepfy: They feldom require bleeding, and purging fhould be ufed with caution: Emetics are of greater fervice, efpecially a little before the fit. In the fit, the beft medicines are thofe which repair the lofs of fpirits, as Ruffian caftor, gum-ammoniac, falt of amber in pills.

Out of the fit, native cinnabar and wild valerian root are moft proper for correcting the juices.

To prevent its degenerating into a chronic difeafe, particularly the hypochondriac paffion, care muft be taken to keep the menfes regular; which muft be done by balfamics, compofed of myrrh and amber, with bitter and carminative extracts, efpecially zedoary and orange peel, made into an elixir, with a moderately fpirituous menftruum. This, frequently taken, helps the digeftion, and promotes a regular menftrual difcharge.

But it is neceffary to obferve, that in hyfteric cafes remedies have a different effect on different women. Some cannot bear fetid medicines, which to others are an immediate

mediate relief. Some have fallen into a terrible ſyncope, and have come to themſelves by ſprinkling cold water on the face, when more powerful and ſpirituous things have failed. Others cannot endure hot things inwardly nor outwardly, as baths, fomentations, liniments, and nervous applications. Anodynes and opiates, which procure eaſe and reſt to ſome, are very injurious to others who are greatly debilitated, and whoſe nerves are weak. Some have recovered from a violent paroxyſm, by a draught of cold water; which, given to others, has increaſed the diſorder.

Peruvian bark given morning and evening, a ſcruple at a time, is an excellent remedy in hyſteric convulſions.

Of the Hypochondriac Passion.

The hypochondriac paſſion is a ſpaſmodico-flatulent affection of the ſtomach and inteſtines, ariſing from an inverſion or perverſion of their periſtaltic motion, and by a conſent of parts, throwing the whole nervous ſyſtem into irregular motions, and diſturbing the whole animal oeconomy.

This diſeaſe is attended with ſuch a train of ſymptoms, that it is a difficult taſk to enumerate them all; for there is no function or part of the body, that is not ſoon or late a ſufferer by its tyranny. It begins with tenſions and windy inflations of the ſtomach and inteſtines, eſpecially under the ſpurious ribs of the left hypochondrium, in which a pretty hard tumour may ſometimes be perceived.

With regard to the ſtomach, there is a nauſea, a loathing of food, an uncertain appetite, ſometimes quite decayed, and ſometimes ſtrong; the aliments are ill digeſted, breeding acid and viſcid crudities; there is a preſſing, heavy pain in the ſtomach, chiefly after meals; a ſpaſmodic conſtriction of the gullet, a frequent ſpitting of limpid phlegm, an impediment of ſwallowing, a violent heart burn, a heat at the ſtomach, very acid belchings, a reaching to vomit, vomiting, bringing up ſuch acid ſtuff, that the teeth are not only ſet on edge thereby, but the very linen or ſheets are ſometimes corroded.

In the volume of the inteſtines, eſpecially the ſmall ones about the navel, there are felt heavy excruciating pains, wringings, grippings, with a rumbling murmuring noiſe; in the groſs inteſtines the pains are more acute. Sometimes there is a looſeneſs, ſometimes a moſt obſtinate coſtiveneſs, with a retention of the wind; which, when it breaks out either upwards or downwards, is attended with an alleviation of the ſymptoms, but they ſoon rage again with as great violence as ever. When there is a frequent urging to go to ſtool, tubercles generally ariſe, and the blind piles beſet the anus; nay, ſometimes a ſymptomatical flux of blood will burſt out. Making water in ſome is difficult and painful; the urine is thin, limpid, and pale; ſometimes it has a copious ſediment mixt with ſabulous concretions, and often reſembles a fit of the gravel.

In the breaſt there is a great ſtraitneſs, conſtriction, exceſſive difficulty of breathing, ſometimes with a ſenſe of fulneſs, a fluttering and palpitation of the heart.

As the diſeaſe increaſes, the head is moleſted with an head-ach, hemicranium, various fixed ſpaſtic pains, and what is commonly called the clavus hyſtericus. A noiſe in the ears, with difficulty of hearing; the eyes are clouded with a ſcotamia; ſome have double viſion, or a pain and dryneſs of the eyes. In the tongue there is a moſt troubleſome burning pain fixed to a certain ſpace, with a plentiful excretion of ſpittle, as if the patient was in a ſalivation.

At length the animal functions are impaired; the mind is diſturbed on the moſt trivial occaſions, and is hurried into the moſt perverſe commotions, inquietudes, anxieties, terror, ſadneſs, anger, fear, or diffidence. The patient is prone to entertain wild imaginations and extravagant fancies; the memory grows weak, and the reaſon fails.

Perſons are moſt liable to this diſeaſe from twenty to fifty, and whoſe ſolids are ſoft, lax, and flabby, and their blood-veſſels ſmall; as alſo who are naturally languid, or have been weakened by tedious maladies. Likewiſe thoſe who lead ſedentary lives, and ſtudy too hard; inſomuch that this is the peculiar diſeaſe of the learned.

The remote cauſes of theſe diſorders are the ſuppreſſion of the hæmorrhoids and menſes, and other periodical fluxes of blood; an hereditary diſpoſition thereto; a cold and moiſt conſtitution of the air; groſs, impure, flatulent diet; a ſedentary, ſtudious life; ſadneſs, cares, troubles, intenſe thinking on a ſingle object; tedious diſeaſes not rightly treated; hard labour in child-bearing.

As to the prognoſtics, if the diſeaſe be recent and left to itſelf, it is rather troubleſome than dangerous; but if it be inveterate, and not ſkilfully treated, or a bad regimen is followed, it is attended with more grievous ſymptoms, producing obſtructions and ſchirri of the viſcera, a cachexy, a dropſy, an hectic, a convulſive aſthma, an incurable melancholy or madneſs, a fatal polypus, *&c.* But if it is cauſed by a ſuppreſſion of the menſes, or bleeding piles, the reſtoring the flux is the cure of the diſeaſe

As continual fear and diffidence are ſymptoms of this diſeaſe, the patients are always foreboding terrible things, and live in conſtant dread of death; which render them fickle, impatient, and prone to run from one phyſician to another. Therefore, when a cure is attempted, they muſt be admoniſhed to be conſtant and patient; and then the following indications may be purſued: 1. To correct and evacuate the acid, viſcid, bilious filth, and flatulent ſordes from the primæ viæ, which yield continual fewel to this diſeaſe. 2. The ſpaſms being appeaſed, to reſtore the natural order of the periſtaltic motion of the inteſtines, and to recover it from a languid ſtate, that there may be a due concoction of the aliment, and a laudable chyle and other fluids generated. 3. To diſperſe the ſtagnated juices; to render the circulation of the blood equable through the abdomen and the reſt of the body; and to free the fluids from all acrimony, after facilitating the excretions by urine and through the ſkin. 4. And laſtly, to corroborate the whole nervous ſyſtem.

To anſwer the firſt intention, nothing is better in the fit than clyſters made with emollient herbs, water gruel ſtrained, camomile-flowers, the tops of yarrow, the oils of ſweet-almonds, dill, camomile, linſeed, *&c.* adding a carminative ſpecies made of caraway, dill, but more eſpecially cumin ſeeds. Theſe ſhould be repeated, if the ſpaſms render them ineffectual. If the fæces are hardened

ed, it will be proper to give oil of ſweet almonds and water gruel inwardly. Nor muſt gentle laxatives of manna, rhubarb, and cream of tartar, be neglected, with a few drops of oil of juniper.

If there is a great deal of acid filth in the ſtomach, crabs-eyes alone will purge.

To correct the ſordes in the *primæ viæ*, give the abſorbent, precipitating, and antiſpaſmodic powers, ſuch as crab's-eyes, mother of pearl, pulvis marchionis, purified nitre, prepared amber, cinnabar, tartar vitriolate, with a little caſtor. It will alſo be proper to take a decoction of any of the following things in the morning in bed, to promote a diaphoreſis, *viz.* balm veronica, betony, agrimony, ſcordium, carduus benedictus, tops of yarrow, daiſy flowers, camomile flowers, fennel ſeed, *&c.*

To reſtore the digeſtive power of the ſtomach, give eſſence of orange-peel, tincture of tartar, dulcified ſpirit of nitre, *&c.*

The paroxyſms are relieved by tepid pediluvia, made of wheat, bran, water, and camomile flowers. The feet muſt be put pretty deep therein.

Out of the fit, to diſcuſs the ſtagnation of the blood, bleeding in the foot will be neceſſary, eſpecially at the equinoxes, and at other times as occaſion ſhall require; but this ſhould be after laxatives and pediluvia. If there is a diſpoſition to an hæmorrhoidal flux, leeches ſhould be applied every month to the anus; and the patient ſhould alſo take balſamic pills, with antiſpaſmodic nitrous powders.

To ſtrengthen the nervous ſyſtem, nothing is better than chalybeates; for they, by a gentle aſtriction, reſtore the nerves to their former ſtrength. Outwardly a ſaponaceous plaſter, with camphor, may be laid to the hypochondria with no ſmall advantage.

Nothing is more friendly, nor gives greater energy to the blood and ſpirits, than riding on horſeback almoſt every day, and for a conſiderable time together. Nor does riding in a coach want its ſhare of ſalutary effects.

Of Melancholy *and* Madness.

Melancholy and madneſs may be very properly conſidered as diſeaſes nearly allied; for we find they have both the ſame origin: that is, an exceſſive congeſtion of blood in the brain: they only differ in degree, and with regard to the time of invaſion. Melancholy may be looked upon as the primary diſeaſe, of which madneſs is only the augmentation.

When perſons begin to be melancholy, they are ſad, dejected, and dull, without any apparent cauſe; they tremble for fear, are deſtitute of courage, ſubject to watching, and fond of ſolitude; they are fretful, fickle, captious, and inquiſitive; ſometimes niggardly to an exceſs, and ſometimes fooliſhly profuſe and prodigal. They are generally coſtive; and when they diſcharge their excrements, they are often dry, round, and covered with a black, bilious humour. Their urine is little, acrid, and bilious; they are troubled with flatulencies, putrid and fetid eructations. Sometimes they vomit an acrid humour with bile. Their countenances become pale and wan; they are lazy and weak, and yet devour their victuals with greedineſs.

Thoſe who are actually mad, are in an exceſſive rage when provoked to anger. Some wander about; ſome make a hideous noiſe; others ſhun the ſight of mankind; others, if permitted, would tear themſelves to pieces. Some, in the higheſt degree of the diſorder, ſee red images before their eyes, and fancy themſelves ſtruck with lightning. They are ſo ſalacious, that they have no ſenſe of ſhame in their venereal attempts. When the diſeaſe declines, they become ſtupid, ſedate, and mournful, and ſenſibly affected with their unhappy ſituation.

The antecedent ſigns are, a redneſs and ſuffuſion of the eyes with blood; a tremulous and inconſtant vibration of the eye-lids; a change of diſpoſition and behaviour; ſupercilious looks, a haughty carriage, diſdainful expreſſions, a grinding of the teeth, unaccountable malice to particular perſons; alſo little ſleep, a violent head-ach, quickneſs of hearing, a ſinging of the ears; to theſe may be added incredible ſtrength, inſenſibility of cold, and, in women, an accumulation of blood in the breaſts, in the increaſe of this diſorder.

Theſe things being duly conſidered, together with the ſtate of the brain in perſons who died of this diſeaſe, we may conclude, that melancholy is a ſtrong and lively working of the fancy, with a fixed attention of the mind to a particular object, which it continually dwells upon; together with a delirium, a long continual dejection, dread and ſadneſs without any manifeſt cauſe, ariſing from a difficult circulation of blood through the veſſels of the brain, where it is too copiouſly congeſted and becomes ſtagnant. Madneſs is a violent rage, attended with raſhneſs and preternatural ſtrength, cauſed by an impetuous motion of a thick melancholic blood through the veſſels of the brain. It differs from a phrenzy, which is a delirium accompanied with a fever, and ariſes from an inflammatory ſtagnation of the blood in the brain: for we learn from experience, that all the ſhining faculties of the mind are changed or depraved, diminiſhed or totally deſtroyed, when the blood and humours, receding from their natural temperament and due quantity, are not conveyed to the brain in a moderate and equable manner, but on the contrary with an impeded, ſlow, and languid motion, or with too briſk and violent an impetus.

Both theſe diſorders ſuppoſe a weakneſs of the brain, which may proceed from violent diſorders of the mind, eſpecially long-continued grief, ſadneſs, dread, uneaſineſs and terror; as alſo cloſe ſtudy and intenſe application of mind, as well as long protracted lucubrations. It may alſo ariſe from violent love in either ſex, eſpecially if attended with deſpair; from profuſe evacuations of the ſemen; from an hereditary diſpoſition; from narcotic and ſtupefactic medicines; from previous diſeaſes, eſpecially acute fevers. Violent anger will change melancholy into madneſs; and exceſſive cold, eſpecially of the lower parts, will force the blood to the lungs, heart, and brain; whence oppreſſive anxieties, ſighs, and ſhortneſs of breathing, tremors and palpitations of the heart; thus vertigoes and a ſenſation of weight in the head, fierceneſs of the eyes, long watchings, various workings of the fancy intenſely fixed upon a ſingle object, are produced by theſe means. To theſe may be added a ſuppreſſion of uſual hæmorrhages, and omitting cuſtomary bleeding:

bleeding: hence melancholy is a ſymptom very frequently attending hyſteric and hypochondriac diſorders.

The cauſes which contribute to the generation of a thick blood, are idleneſs and inactivity, which weaken the body, impair the functions, diminiſh the ſalutary excretions, and render the humours thick, viſcid, and ſtagnant: All which are heightened by ſolitude, which is apt to give riſe to various fantaſtic and gloomy ideas in the patient's mind.

Likewiſe acid humours in the ſtomach will increaſe the appetite, and tempt them to feed on coarſe, groſs, flatulent aliments, without drinking enough to dilute them ſufficiently, whence a matter proper to nouriſh theſe diſeaſes will proceed. It is evident from obſervation, that the blood of maniac patients is black, and hotter than in the natural ſtate; beſides, the ſerum ſeparates more ſlowly and in leſs quantity than in healthy perſons. The excrements are hard, of a dark-red or greyiſh colour, and the urine is light and thin.

Diſeaſes of the mind have ſomething in them ſo different from other diſorders, that they ſometimes remit for a long time, but return at certain periods, eſpecially about the ſolſtices, the times at which they firſt appeared. It may likewiſe be obſerved, that the raving fits of mad people, which keep the lunar period, are generally accompanied with epileptic ſymptoms.

This diſeaſe, when it is primary or idiophatic, is worſe than the ſymptomatic that accompanies the hyſteric or hypochondriac paſſion, which is eaſily cured; as is that alſo which ſucceeds intermitting fevers, a ſuppreſſion of the menſes, the lochia, the hæmorrhoids, or from narcotics. When the paroxyſms are ſlight in the idiophatic kind, the cure is not very difficult: but if it is inveterate, and has but ſhort remiſſions, it is almoſt incurable; which is often owing to this, that they reject phyſicians and their medicines as poiſon. It is a bad ſign, if, after a profouud ſleep, the patient ſtill continues delirious, and is inſenſible of cold, or is unaffected with ſtrong draſtic medicines. If after want of ſleep and long abſtinence the patient is exceeding weak, or becomes epileptic, convulſive, or lethargic, death is not far off. Mad people are ſeldom ſubject to epidemic or other diſorders, and ſome have lived ſeventy years and upwards in this unhappy ſtate.

Sometimes this diſeaſe terminates by critical excretions of blood from the noſe, uterus, or anus. Sometimes diarrhœas and dyſenteries will terminate theſe diſorders. Puſtules, the itch, and ulcers, have alſo done the ſame.

In the cure, bleeding is the moſt efficacious of all remedies; and where there is a redundance of thick, grumous blood, a vein is firſt to be opened in the foot, and a few days after in the arm; then in the jugular vein, or in the noſtrils with a ſtraw; and, laſt of all, the frontal vein with a blunt lancet, for fear of hurting the pericranium, a ligature having been firſt made round the neck to render the veins tumid.

Tepid baths are alſo convenient, to drive the blood from the head to the inferior parts; and before the patient enters the bath he ſhould have cold water poured on his head, or it ſhould be covered with a cloth dipt therein; for cold water pumped or poured on the head conſtringes and corroborates the veſſels of the brain weakened with ſtagnant blood, and promotes the more eaſy diſcuſſion of the humours congeſted therein.

Purgatives are likewiſe uſeful; but the lenient are preferable to the draſtic: Thus manna, caſſia, rhubarb, cream of tartar, tartar-vitriolate, are moſt convenient when the diſeaſe ariſes from the hypochondriac paſſion, and a ſtagnation of the blood in the inteſtines, and the ramifications of the *vena portæ;* eſpecially when they are taken in decoctions and infuſions, not all at once, but at repeated intervals, ſo as to operate in an alterative manner.

Some kinds of mineral waters are alſo highly efficacious in melancholy and madneſs; for ſince madneſs generally derives its origin from the melancholy, and melancholy from the hypochondriac paſſion, and the hypochondriac paſſion from impure and peccant fluids ſlowly circulating through the inteſtines and viſcera of the abdomen, the circulation of the blood ought to be rendered free and eaſy. It is no wonder therefore that mineral waters have been held in high eſteem for the cure of theſe diſorders; for theſe being impregnated with a highly pure alkaline and neutral mineral ſalt, if they are drank in a due quantity, they not only change the peccant humours, but incide ſuch as are thick, render the glutinous fluid, and open the obſtructions of the veſſels; they alſo relax the tenſe fibres of the ſolids, and corroborate the weak and tender, as well as, by ſtimulating the emunctories, they reſtore all the ſalutary excretions. The waters of Selters mixed with aſſes or goats milk have not their equal in theſe caſes. They ſhould be drank in the ſpring and fall for five or ſix weeks. The proportion is one part milk to three of water.

But, after all, there is nothing better to remove the cauſe of theſe diſorders than depurated nitre, but eſpecially in that ſpecies of madneſs which inclines to melancholy; for it corrects the bilious acrimony of the humours, allays the tumultuous motions of the ſolids, by diminiſhing the preternatnral heat. Sennertus and Riverius affirm, that nitre, given with a little camphor, is a ſpecific in madneſs.

Particular medicines among vegetables are, balm, betony, vervain, brook-lime, ſage, wormwood, flowers of St John's wort, of the lime-tree and camphor: from animals, aſſes blood dried: among minerals, ſteel, cinnabar, ſugar of lead, and the calx and tincture of ſilver.

Camphor is much praiſed by the moderns, particularly by Etmuller.

And Dr Friewald affirms, that with a few doſes of camphor, of xvj grains each in pills, he has cured ſeveral mad patients, even in inveterate caſes.

Stahl recommends a powder of the following cephalic and nervine herbs; vervain, ſage, betony, with plaintain and white maidenhair.

As to diet, the patient ſhould carefully abſtain from ſalt and ſmoak-dried fleſh, whether beef or pork; from ſhell fiſh; from fiſh of a heavy and noxious quality; from aliments prepared with onions and garlick, all which generate a thick blood. In general, he ſhould eat no more than is neceſſary to ſupport nature. Small-beer or pure cold water are the beſt drink. Sweet and ſtrong wines are highly prejudicial; as is alſo exceſſive ſmoaking tobacco,

tobacco; for it not only penetrates thick blood, but throws the fluids into preternatural commotions. Change of air and travelling may be beneficial.

Though in deliriums bleeding is highly useful, yet it agrees best with those that are plethoric, bilious, and in the vigour of youth: these likewise will bear frequent purges of corrected hellebore; but then the strength must be repaired by cordial, corroborating, and anodyne sedatives. When the patient is exhausted, bleeding is hurtful, and restoratives good.

As a high degree of the itch has terminated these diseases, it will be proper to make issues in the back, or to procure ulcers with a potential cautery near the spine of the back.

Sedative medicines are good; but not opiates and narcotics, for these induce stupidity and folly. Those that are good in an epilepsy, will be beneficial here; such as castor, shavings of hartshorn, the roots and seeds of piony, and anti-epileptic powders, the valerian root, flowers of the lily of the valley and of the lime tree.

And to the other sort of madness, which proceeds from being exhausted and weakened by autumnal, violent, and obstinate intermitting fevers, and from their being injudiciously treated with bleedings and purgings, it is only to be cured by restoratives, cordials, and corroboratives, long persisted in.

Of the Hydrophobia.

This disease, as it generally proceeds from the bite of a dog, is called *rabies canina*, or the canine madness; and from its most terrible symptom, the dread of water, *hydrophobia*. It almost always arises from the infection communicated by the bite of a mad animal: yet it has been observed to arise spontaneously in some animals affected with acute diseases.

Almost all kinds of animals may be afflicted with this disorder, and may infect other animals, and even men; as dogs, cats, wolves, foxes, horses, asses, mules, horned cattle, hogs, monkeys, and cocks; but it most frequently attacks the dogs, wolves, and foxes, without any previous contagion.

A hot climate, excessive heats and sudden colds; a long and dry season; feeding upon putrid, stinking, verminous flesh; want of water; worms generated in the kidneys, guts, brain, or nostrils; are the preceding causes of madness in these animals.

When they are going to run mad, they appear dejected, shun company and hide themselves; they will not bark, but seem to mutter or murmur, and are averse to food and water; they will fly upon strangers, but retain some regard for their master; their ears and tails hang down, and they walk along as if they were sleepy. This is the first degree of the disease; and, though the bite is then bad, it is not at the worst. Afterwards they begin to pant, hang out their tongues, froth at the mouth, and gape. Sometimes they seem dull and half asleep; sometimes they will run, but not directly forward, and soon cease to know their masters. Their eyes are dejected, look watery and dusty, their tongues are of a lead colour, they fall away suddenly, and grow raging mad. A bite at this time is incurable; and the nearer they are to death, with the more dreadful symptoms it is attended.

There is scarce any poison infectious so many ways as this: for it takes effect through the cloaths, without fetching blood; by the breath of the animal drawn into the lungs; by a touch of the froth, if recent; and by applying it to the lips or tongue, when it has been long dried; or by kissing a dog that is mad; or by handling the wound or instrument which was the death of the animal; or by handling things which have been infected by any of the former means.

Again, there is scarce any poison which produces such terrible effects, and causes such a wonderful change in the person infected. When it begins to work, it is most violent and quick; and yet, as it is said, it will sometimes lie dormant for years together before it exerts itself. This diversity depends on the heat of the season, the degree of the disease of the infected animal, and the temperament of the person bit. For the bilious are soonest affected by it; the phlegmatic and hydropic the least; likewise something may be attributed to the way of living, diet, and medicines.

A healthy man, infected with this contagion, finds the effects of it discover themselves in the following order. There is a pain in the place where he was bit, or received the contagion; and then wandering pains in the other parts, chiefly those that are near it; a lassitude, heaviness, listlessness of the whole body; inquiet troubled sleep, and terrible dreams, with convulsions, and subsultus of the tendons; continual inquietude; sighs, sadness, love of solitude: This ends the first degree of the disease. Afterwards all the former symptoms increase, with a prodigious straitness or oppression about the præcordia; a difficult sighing respiration; horror; a shaking and trembling at the sight of any liquid, or bright, pellucid thing; loss of appetite; a possibility of swallowing any thing solid; but, if any liquid is touched with the lips and tongue, it occasions an incredible anxiety, trembling, and terrible convulsions, almost forcing the patient into a rage; then a vomiting of dark, bilious, viscid matter, or porraceous bile; an increased heat, a fever, continual watching; a priapism; a confused series of wild, extravagant thoughts: Here the second degree of the disease may be said to terminate. Now all the symptoms grow worse and worse: the tongue hangs out, and is rough; the mouth is wide open; the voice is hoarse; the thirst great; strange horrors, starting, and wild looks, at the sight of water; a frothing at the mouth; an involuntary inclination to spit at the by-standers, as also to bite them, which the patient cannot resist. He foams at the mouth, and gnashes with his teeth; and would do mischief, if not forcibly with-held. His pulse and breathing fail: there is a cold sweat, and the highest fury: yet during all this time, which is wonderful, the patient continues in his senses, and is afraid of doing any harm. On the fourth day from the first degree of the disease, the patient falls into convulsions, with great difficulty of breathing; and then dies.

The dissection of persons who died of this disease has shewn, that the organs of swallowing have been in some measure inflamed; that various kinds of bilious viscidities are collected in the stomach; that the gall-bladder is full of

of a black bile; that the pericardium is dry; that the lungs are incredibly distended with blood; that the heart is full of an almost dry blood; that the arteries are full, and the veins almost empty; that the blood is very fluid, and will hardly coagulate when exposed to the air; whereas that which was drawn from a vein three days before, coagulated as usual; that all the muscles, viscera, brain, cerebellum, and spinal marrow, are more dry than common.

The prevention and cure of this disease, except in a few instances, are very doubtful and uncertain: which may be attributed to the boasting pretences of some to specifics, and the neglect of a due method of cure, founded on the history of the disorder.

So far therefore as may be conjectured from the preceding history of the disorder, and from comparing it with other diseases, as also from the few instances which have been attended with a happy event, it seems chiefly to consist in an affection of the nerves, which most nearly resembles convulsions, which occupy the viscera and the vessels thereof; whence arises a disorder in the blood and humours, which is not unlike a gangrenous inflammation. The seat of the disease is chiefly about the stomach and the neighbouring parts.

The preventive cure consists in making deep scarifications, as soon as possible after the bite, in the part affected, and those adjacent to it; that they make a considerable discharge of blood, and apply large cupping-glasses thereon; or it may be burnt pretty deep with an actual cautery. Then it should be made to suppurate by some corrosive application proper for that purpose; and during all that time it should be continually fomented with a pickle made with vinegar and salt: this should be continued for six months at least. The garments he had on at the time of the bite should be cautiously laid aside or destroyed. He should likewise with all convenient speed be dipped in a river, or the sea, making him believe that he is going to be drowned. This is to be often repeated; for the effect consists in terrifying the mind, not in the salt-water, as we have learnt from experience. Then he should also be often and strongly purged with rhubarb, agaric, and the juice of elder-bark.

The patient should also be put into a sweat every morning fasting, with a mixture of aromatic vinegar, sea-salt, and hot water. His feet and hands should also be daily fomented in a warm bath; and he should wash his head, mouth, and fauces.

Let him often drink cold water, and throw it up again by vomiting; and let his drink be acidulated. His aliment should be moist, light, and laxative, and often taken in such a quantity as to vomit it up again. He should likewise abstain from things that are to spicy, from wine, from heating things, from violent exercise, and from commotions of the mind.

The cure should be attempted when the disease is in the first degree, and in the beginning of the second, by treating it as highly inflammatory, by letting blood from a large orifice even to a deliquium, by giving clysters soon after with nitrous or moderately salt water.

After this let the patient be blind-folded, and thrown into a pond of cold water; or let cold water be thrown upon him till the dread of it almost ceases; then let a large quantity be forced down his throat: let this be his treatment daily, and at night let sleep be procured. And this method is better than that pernicious one of giving him the most acrid heating and drying medicines; which exasperate the nervous system, and are in this case as bad as poison, to a patient already almost parched with heat.

Celsus informs us, that it was the practice of old to put the patient bit by a mad dog into a bath, and there to let him sweat as long as his strength will permit, at the same time keeping the wound open, that the virus might be discharged from it; and then to give him plenty of good generous wine. This being done for three days, they judged him out of danger.

This may give some light into the nature of the pulvis antilyssus published by Dr. Mead, and received into the dispensatory of the college, wherein pepper is one of the ingredients:

1. Take four drams of ash-coloured ground liver-wort, and two drams of black pepper, beat into a powder.

This is to be divided into four doses, whereof one to be taken in warm milk in a morning, fasting, for four mornings successively. After this he is to be put into a cold bath, pond, or river, for thirty days together, early in the morning before breakfast.

Another famous specific is the East-india medicine; which is doubtless an egregious antispasmodic, and is as follows:

2. Take native and factitious cinnabar, of each 24 grains, and 16 grains of musk. Make them into a powder.

This is to be taken in a tea-cup full of arrac or brandy, and is said to secure the patient for thirty days, at the expiration of which it is to be repeated; but, if he has any symptoms of the disease, it must be repeated in three hours, which is said to be sufficient for a cure.

Dr. Wall of Worcester has found two doses of musk, of xv grains each, to produce very happy effects on two persons labouring under a subsultus tendinum, with extreme anxiety, and want of sleep, from the bite of a mad dog; for it perfectly relieved them from their complaints. We have a singular case of a woman actually seized with an hydroprobia, given by Dr. Nugent; who was cured. He ordered this powder to be taken in honey every three hours, after she had lost 15 ounces of blood, and a pill of 2 grains of pure opium along with the powder, till rest was procured.

Of Poisons.

There are three essential marks of poisons which distinguish them from other things that are noxious to human bodies. The first is, that they consist of most subtile parts, and consequently are pernicious in a small quantity. The second, that they pervert, in a short time, the regular motions of the solids and fluids throughout the body, and induce the most grievous symptoms, even death itself. And the third, that they exercise their cruelty on the most subtile fluid, and the most nervous parts.

All the three kingdoms have poisons peculiar to themselves; but the animal kingdom affords the most subtile, which are communicated by the the bite of mad or venomous

ous beasts when they are angered. The mineral kingdom produces arsenicals and mercurials; and the vegetable, herbs and plants, of a most acrid, noxious and deleterious quality, such as the most violent cathartics and narcotics.

Every sort of poison seems to have an effect peculiar to itself: thus mercury attacks the fauces and their glands, producing ulcerations therein; arsenic occasions the most cruel torments, convulsions, and mortification of the coats of the intestines; the seeds of datura, a kind of stramonium, induce madness or absolute stupidity; hyoscyamus causes a stupor, and so troubles the imagination, that the person affected believes he sees dæmons and spectres. Opium brings on sleepiness, and a torpor on the mind. Sharp, drastic purges inflame the intestines. The bite of a mad dog occasions the dread of water. The sting of a scorpion produces a sudden and exceeding cold sweat. Litharge, unwarily taken, causes a convulsive colic, with an obstinate costiveness. The berries of deadly night shade produce madness, rage, or folly; as do also the roots of cicuta terrestris.

The bites of mad animals have been already treated of: and, as for others, it appears from experience, that the bites or stings of other animals, such as spiders, scorpions, and vipers, are most pernicious in hot countries; and neither the insects, nor any other animals, are poisonous of themselves, but their stings or bites, when they are mad, or provoked to anger.

The venom of animals, whether in a rage or madness, communicates an infection by the saliva, milk, and lympha.

The symptoms which follow the bite of a viper, are a sharp, pricking pain in the wounded part; a tumour, which is first red, and afterwards livid, sensibly extending itself to the neighbouring parts: the skin frets, and breaks out into little bladders: some time after, a remarkable faintness supervenes, with a quick, weak, and sometimes an intermitting pulse, a palpitation of the heart, a stupefaction of the senses, an anxiety of the præcordia, a great sickness of the stomach with bilious vomiting, a dulness of sight, sometimes pains about the navel or the region of the liver, difficult breathing, hiccups, tremblings, convulsions, cold sweats, coldness of the extremities; after which, death closes the scene, unless prevented by timely remedies. If the patient survives, a tumour with inflammation continues for some time. Sometimes a sanies flows from the wound, and pustules appear, like the herpes exedens; the skin becomes yellow, as if the patient had the jaundice.

Hoffman observes, that externally in all venomous bites it will be proper to apply such things as relax and mollify the strictures of the parts, that open the pores, and so procure an exit for the virulent matter.

Boyle observes, that a hot iron held over the wounded part, immediately after the bite, so checks and weakens the venom, that the patient will have nothing to complain of but a pain in the part of short continuance.

But, above all, Mead, from many experiments, recommends the fat of vipers, which, being rubbed into the wounded part, renders all others useless; and, if that is not at hand, it appears from some late trials, that common sallad-oil, rubbed warm into the part, will do as well.

The bite of a Rattle-Snake, hitherto looked upon as a most terrible accident, may now be cured in a simple, easy manner. It is the invention of a negro; for the discovery of which, he had his freedom purchased, and an hundred pounds per annum settled upon him during his life by the general assembly of Carolina.

Take of the roots of plantane and horehound (in the summer the roots and branches together) a sufficient quantity; bruise them in a mortar, and squeeze out the juice, of which give as soon as possible one large spoonful; if the patient be swelled, you must force it down his throat. This generally will cure; but, if he finds no relief in an hour after, you may give another spoonful, which never fails.

If the roots are dried, they must be moistened with a little water. To the wound may be applied a leaf of good tobacco moistened with rum.

The mineral kingdom furnishes very few real poisons: the only natural one is cobalt; the factitious are arsenic, corrosive sublimate, and glass of antimony.

Cobalt is a kind of a marcasite, which is found in great plenty in the mines of Misnia; and is well known for its poisonous quality, so fatal to insects, brutes, and men. In making the blue glass, or enamel, called smalt, from this mineral, a sort of white flowers arises, which, being melted in a stronger fire, is called white arsenic. If this be melted again with an eleventh part of sulphur, it becomes yellow arsenic, and, with a sixth part of sulphur, red. Of these, the white is the most deadly poison.

As for the true mineral poisons, they were entirely unknown to the ancients; for they reckoned quicksilver, crude antimony, all kinds of vitriol as well as ceruss, and the lapis lazuli, in that class; but orpiment, which they called arsenick, as Celsus testifies, and looked upon as a poison, is void of all virulence and deleterious qualities; and sandarach they termed red arsenic, which is made of melted orpiment, but is no more noxious than the former. Indeed, it must be owned, that the above catalogue are not altogether friendly to human nature, or may be endued with a corroding quality; but they want the true characteristic of poisons.

Quicksilver, dissolved in acid mineral spirits, is likewise a poison, though of itself it is entirely innocent. This has chiefly appeared from errors in practice, when the mercury has not been rightly prepared and corrected.

Likewise glass of antimony reduced into powder, and exhibited, causes enormous vomiting, with most cruel gripings, which often end in death.

Arsenic, taken inwardly, creates a pricking, vellicating, irritating, burning sensation, with a heat and most violent pain in the stomach, a racking torture in the bowels, vomiting, unquenchable thirst, a roughness and dryness of the tongue, fauces and gullet, with hiccups: then follow most cruel anxieties, palpitation of the heart; fainting, coldness of the extremities; sometimes black vomits, and stools with a fetid cadaverous smell; a gangrene and mortification of the stomach and intestines, which usher in death.

Milk is very useful against all corrosive poisons, by its soft, oleous contexture, blunting their acrimony; and is a good vehicle to bring them up by vomit.

In all cafes where a perfon is fufpected to have been poifoned by fwallowing any fubftance of a corrofive nature, oil with milk for a vehicle yields the moft certain relief; and even when acid mineral fpirits are taken by miftake, they will blunt or fheathe the acrimony fooner than fixed falts and teftaceous powder will change their nature: befides, fallad-oil is generally at hand in all places as well as milk; and the fooner it is given, the lefs is the danger.

The moft dangerous vegetable poifons, are wolf's-bane, the deadly night-fhade, henbane, and datura; to which may be added the roots of oenanthe cicutæ facie, or hemlock dropwort, cicuta vulgaris or common hemlock.

Hoffman affirms, that milk in a large quantity is an univerfal remedy againft all poifons that kill by inflammation, and if taken in time will prevent the direful confequences. Allen thinks a vomit with warm water and oil, taken in large draughts and often repeated, will be of great fervice; as alfo warm water with frefh butter, milk and oil, or milk and butter. If the above things will not provoke the patient to vomit, oxymel of fquills, falt of vitriol, or a decoction of tobacco, may be ufed, as having a more immediate effect. It is hardly fafe to give even the moft gentle cathartic.

The ftomach being thus emptied of all, or as much as poffible, recourfe muft be had to generous wine and alexipharmics, fuch as venice-treacle, confectio alkermes, the bezoardic powder, *&c.* When there is a fufpicion that the coats of the ftomach or inteftines are corroded or ulcerated, it will not be proper for the patient to ufe fpices or vinegar, nor to indulge in too much wine, but to take a decoction of barley with raifins, or a decoction of chinaroot, faffafras, *&c.*

The fame method is moft likely to anfwer when any other deleterious herb or root has been eaten by miftake, though the particular fpecies fhould not be known; and Hoffman affirms, that when the patient has been ftupified by the narcotics, the beft remedies are vomits mixed with oil, to facilitate the operation.

Of a Gutta Serena.

A Gutta ferena, or amaurofis, is an abolition of the fight, when no fault appears in the eyes, except in the pupil which is larger than ufual and more black, nor will it contract, though any luminous object is placed directly before it, but continues quite immoveable. It may be diftinguifhed from the diforder of the eyes proceeding from the vertigo; fort he objects feem to turn round: From a cataract; for then an opacity of the cryftalline humour is perceivable, and the pupil will contract in a glaring light.

When this difeafe comes on fuddenly, it generally proceeds from external caufes, as blows, falls, and the like. When it comes on by degrees in old perfons, it arifes from a hemiplexy or palfy; as alfo in other weak and languid conftitutions. Sometimes its concomitants are pains in the head, the vertigo, fleepinefs, noife in the ears, and fometimes it comes on without any preceding fymptoms.

From diffections it has appeared, that the optic nerves have been in fault; that is, they are wafted away or much lefs than common; as alfo compreffed by extravafated fluids, or hard tumours about their origin.

The indications of cure are, to difcufs the ftagnating humours, which comprefs the nerves, and then to ftrengthen the affected parts.

Heifter affirms, it is to be cured by aromatics, carminatives, and attenuants; chiefly eye-bright, veronica, hyffop, rofemary-flowers, fage, fennel, and anifeeds, valerian root, faffafras, cinnamon, wood-lice, either in infufion or powder: the juice of wood-lice newly expreffed, and taken for fome weeks, increafing the dofe, is of excellent ufe; as likewife mercurials, taken in very fmall dofes, and a long while together.

If it arifes from a fuppreffion of ufual hæmorrhages, they are to be reftored; but, if this cannot be done, artificial bleeding is to be fubftituted.

Externally, iffues are held to be good, clyfters and fetons, efpecially in the phlegmatic. The eyes may be wafhed with fennel, valerian, eye-bright, or rofe-water, fpirit of wine, Hungary water, and fal-volatile oleofum diluted, or an infufion of fennel-roots in wine, with bags of ftrengthening herbs and fennel-feeds often put thereon. Sneezing powders may likewife be proper, efpecially florentine orrice, or horfe chefnuts; likewife fpirits of hartfhorn, or fal-volatile oleofum, may be applied to the nofe.

In all diforders of the eyes, but particularly in this, the body muft always be kept open, that the humours may be invited downwards, with laxative pills mixed with calomel. Likewife ftrong clyfters are of very great ufe.

Of a Suffusion, *or* Cataract.

A Suffusion, or cataract, is an obftruction of the pupil, by the interpofition of fome opaque fubftance, which diminifhes or extinguifhes the fight: Some are thicker than others; fome are white, black, citron-coloured, or brownifh. It is always contained between the uvea and fclerotica, where it fometimes fwims and fluctuates like a bit of lawn in the aqueous humour, and fometimes it adheres clofe to the coats. It is generally an opacity of the cryftalline humour.

The medicines above mentioned, in an incipient or recent cataract, from thick or vifcid humours, may do good, efpecially if they arife in the cryftalline humour, as Heifter affirms, becaufe they attenuate, refolve, and render the humours fluxile, and increafe the fpirits. A grain or two of mercurius dulcis, given with twice the quantity of prepared oifter-fhells for thirty days together, has deftroyed the rudiments of a cataract. But, if thefe have no effect, and the cataract grows inveterate, ripe, or perfect, it is to be depreffed; for which, fee Surgery.

Of a Glaucoma.

A Glaucoma is a change of the cryftalline humour into an azure colour, from its drynefs and condenfation, as fome affirm: but Heifter fays, it arifes from an opacity of the vitreous humour, which becomes of a whitifh green colour; for, in a fuffufion, an opaque body is placed behind the pupil, or is next to the uveous part.

Sennertus fays, this malady is known from a very remarkable whitenefs appearing in the eye, and lying deep behind the pupil, and all things are feen as through a fmoke or cloud; it is faid to be incurable.

Of the Amblyopia, *or* Obscurity of Sight.

The amblyopia is an obscurity of sight, and is fourfold: myopia, or short-sightedness; presbytopia, or seeing only at too great a distance; nyctalopia, or seeing only in the night; amaurosis, of which before.

Myopia proceeds from the too great convexity of the cornea, or crystalline homour, or from the eyes being larger than common, as we learn from optics. This is best assisted by concave glasses.

Presbytopia proceeds from the contrary causes, and receives assistance from glasses of a convex form.

Nyctalopia is a twofold malady, in which the complaints are contrary to each other. In the first species, the sight is best in the night, and in obscure places; but in a clear light the sight fails, and they can hardly see any thing at all. In the other sort, which is improperly called a nyctalopia, they see nothing at all, except in a clear and bright light. This infirmity arises from a naturally bad formation of the eye, and is therefore incurable. The presbytopia may likewise be assisted by cephalic and strengthening medicines, by watery and vinous infusions, and comforting eye-waters.

Of a Strabismus, *or* Squinting.

A Strabismus, commonly called squinting, is an unequal contraction of the muscles of the eye, either from a spasm, an epilepsy, or a palsy, whereby the axis of the pupil is drawn towards the nose, temples, forehead, or cheeks; so that the person cannot behold an object directly. Infants readily contract this distemper, sometimes for want of care in the nurses, who place the cradles in a wrong position, with regard to the light. Children likewise, while growing up, sometimes fall into this disorder, either from ill customs contracted in playing, or by looking on others who are affected with it.

This disorder is very difficult to cure; therefore the utmost care should be taken to prevent it, and the cradle should be so placed as not to occasion the child to look a-wry. Ægineta contrived a mask, and so adapted it to the face, that nothing could be seen except through two holes straight forward; and for the same purpose what we call gogglers are used.

Of the Albugo, *or* Spot *in the* Eye.

An Albugo, or leucoma, is a whitish spot of the transparent cornea; the broader and thicker it is, the more it obscures the sight; when it is superficial, it appears the whiter; and, when it is deeply rooted, it tends to blackness, and is scarce curable. That whi h is in reality a cicatrix, or scar, left after a wound or ulcer in the eye, is very difficult to be dissipated; that which follows an inflammation of the eye often goes away of its own accord.

It may be distinguished from a cicatrix, because this is of a shining white and without pain; whereas the albugo looks like chalk, is attended with a slight fluxion and some degree of an inflammation with pain. It is generally the forerunner of an ulcer.

The intentions of cure are answered by emollients, resolvents, and discutients, which must be used with great caution. To take away a cicatrix, the sharpest topics, nay, cathæretics, are sometimes to be used, with a very prudent hand: but, first of all, mild things may be tried; and, if they fail, we may proceed to stronger.

Of a Sugillation, *or* Bloodshot Eye.

A Sugillation first appears of a reddish colour, and afterwards livid or black. It is caused by a stroke or fall, or violent vomiting, whereby the blood is extravasated in the coats of the eye. If the cornea is affected very much, all objects appear of a reddish colour; for some veins run to the cornea, in the part towards the iris, or the blood may be poured out into it from the neighbouring vessels.

If the disorder is great, there will be occasion for bleeding and purging, for the grumated blood in the sugillation is to be resolved and discussed, which may be done by discutients, such as juice of fennel, with balsam of Peru, juice of celandine, simple honey-water, mixed with other eye-waters.

If from this or any other cause there should happen to be an ulcer of the eye, Demours recommends coarse sugar as a good ingredient for deterging those of the cornea, in which astringents are hurtful; but it must be mixed with collyria. When the aqueous humour of the eye is evacuated at a wound or ulcer of the cornea, he exposes the patient to the light, from time to time, till the cornea is again raised by the aqueous humour; for the light occasions a motion in the iris, which may prevent its adhesion to the cornea.

Of the Epiphora, *or* Lippitude *of the* Eyes.

An epiphora is a defluxion of a salt sharp humour upon the eyes, attended with itching, pain, and redness; as also a dimness of sight. It is but slight when there is no defect in the bulb of the eye, when the eye-lids swell and look red, when the matter of the fluxion is thick and sometimes glues the eye-lids together in the night, continuing in this state for some time.

Children are often afflicted with this disease, particularly those who have had a scald-head improperly cured; or who have swellings in the glands of the neck or about the ears, and then it cannot be cured until these tumours are discussed It sometimes likewise succeeds the small-pox and measles.

The seat of this disease is in the glands of the eye, especially in those called the lachrymal glands.

This disease may be certainly cured in the beginning, by a plentiful drinking the infusion of the leaves of veronica, in the manner of tea, for some time. When it is inveterate, the patient must be very regular in his diet, and must avoid every thing salt, sharp, acid, wine, strong-beer, and drams. His common drink may be a decoction of hartshorn and fennel-seeds, using warm pediluvia at night going to bed.

Externally a grain of vitriol may be mixed with unsalted butter, to which a small portion of sugar of lead may be added and put into the greater corner of the eye. This is a most useful medicine. When the lippitude is of the dry kind all acid applications must be avoided, and the eyes must be covered with a poultice of white bread

bread and milk, with a little ſaffron mixed with it. The ſucceſs of ſetons and iſſues is uncertain, but a perpetual bliſter on the nape of the neck is of great ſervice. But it muſt be continued for a conſiderable time.

Of the Fistula Lachrymalis.

The fiſtula lachrymalis is a diſeaſe which attacks the great caruncle in the inward corner of the eye, and ſtopping up the natural paſſage of the tears, forces them to run down the cheek: but this is the firſt degree of the diſeaſe. The ſecond is, when pus is mixed with the tears, which proceeds ſometimes from an opening in the ſkin between the noſe and the great corner of the eye. The laſt is, when the pus has not only corroded the neighbouring parts which are ſoft, but has affected the bone which lies underneath. This ſort of fiſtula ſometimes turns cancerous; and Riverius adviſes not to meddle with it at all.

Whatever may be the cauſe of this diſorder, whether the ſmall-pox or the French diſeaſe, it always ſtops up the naſal conduit, which is opened by an operation. See Surgery.

Of Deafness.

The cauſes of deafneſs are a cutting off the external ear, or an obſtruction of the auditory paſſage from wax or other things; from a rupture of the membrane of the tympanum, or when it is corroded or ulcerated, or the auditory nerve is obſtructed or compreſſed. External cauſes are, falls from high places, exceſſive noiſe, ſuch as the exploſion of cannon; likewiſe acute diſorders near their ſtate, which are like to terminate by a critical hæmorrhage.

As to the prognoſtics, thoſe who are born deaf are rarely cured. A real deafneſs is hard to remedy. A deafneſs in acute diſeaſes, with crude urine, foretells a delirium; but, when the ſigns of coction are good, it portends a critical hæmorrhage.

With regard to the cure; if the obſtruction be in the external cavity of the ear, it is diſcernible by the ſight. If there is occaſion to ſyringe the ear, a decoction of ſage and roſemary-flowers will be proper, with equal parts of water and white-wine; but great caution ſhould be uſed. Some pump the head with warm bath waters. Some ſay, the eggs of ants bruiſed and put into the ear, with the juice of an onion, cure the moſt inveterate deafneſs. Others affirm, that a ſalivation will ſometimes perform a cure.

A critical deafneſs will ceaſe of itſelf. Etmuller recommends amber and muſk.

Hoffman ſays, deafneſs ſometimes ariſes from a ſlackneſs of the auditory nerves, which often happens from too great a humidity, which, if neglected, will terminate in a perpetual and incurable deafneſs, and may be diſperſed, if taken in time, by proper cephalics and ſudorifics. Some for this purpoſe recommend equal parts of ſpirit of lavender and hungary water, which ſhould be dropt warm into the ear. Lindanus adviſes the gall of an eel mixed with ſpirit of wine; and others, the fumes of ſulphur conveyed into the ear, with a pipe or funnel. But regard muſt be had to the cauſe, if diſcoverable.

Of a Tinnitus, *or* Noiſe *in the* Ears.

Hoffman obſerves, that this is cauſed by the ſpaſms of the coats of the ear, which line the inward parts, ſuch as the labyrinth, cornea, and auditory paſſage, which is often attended with intolerable anxiety.

The cure is to be performed, ſays Heiſter, by temperate diaphoretic powders, and reſolving eſſences, commonly called anticatarrhales; as of amber, the woods, roſemary; together with diaphoretics and alexipharmacs, taken often in a day, with tea of betony, with roſemary flowers, ſage, or lavender and ſaſſafras. In the morning, and at noon, the eſſences are to be taken; and at night the powders.

Outwardly, eſſence of amber may be applied, either alone, or with a few drops of oil of amber, or one or two drops of camomile put into the ear with cotton, morning and evening; or a grain or two of amber and muſk, or caſtor in cotton, either alone or with Peruvian balſam; or carminative oils, ſuch as aniſe, fennel, carraways, or calomel; not neglecting pediluvia, and frequent rubbing of the feet and head.

Of a Coryza, *or* Catarrh *of the* Noſe.

A Coryza is too great a moiſture of the noſe, by a thin ſharp ſerum, which gradually becomes thick, and ſometimes coloured.

The cauſe of this diſorder proceeds from the lympha and maſs of blood, moſt commonly in the winter-time, which hurts the noſtrils; at firſt it ariſes from a thin, ſharp humour, which excoriates the parts, which, becoming more thick, almoſt ſtops the noſtrils and hinders breathing. Sometimes it ariſes from ſternutatories too often taken, and from mineral fumes; this is accompanied with ſpitting and a cough. Sometimes the effluvia, affecting the noſtrils, have the nature of a ferment, and become infectious.

As to the prognoſtics, it is without danger, unleſs the lymph is exceeding ſharp and ulcerates the noſtrils, and ſo degenerates into an ozæna, or ſordid ulcer of the noſtrils. Hoffman ſays, this excretion is often ſalutary, and is exaſperated by purges.

With regard to the cure, the irritation is to be ſtopped in the beginning, by joining laxatives with ſudorifics, according to the condition of the patient, the ſeaſon of the year, and the reigning diſeaſes. To ſtop the irritation, oil of aniſeed is very proper; but if the noſtrils are red, painful, and excoriated, it muſt be mixed with barley-flour well dried. Camphor diſſolved in oil of almonds is likewiſe good externally applied, and the ſmell of horns when raſped, as well as the vapours of gum-anime, received into the mouth and noſe. The vapours of amber, frankincenſe, maſtic, and benjamin, are likewiſe uſeful. A coacervation of the mucus may be evacuated by diſtilled oil of marjoram, amber and aniſeed, mixed with leaves of marjoram, and made into ſnuff; or, by a ſternutatory of calcined white vitriol, twelve grains of which may be mixed with two ounces of marjoram water, and filtrated. If the noſtrils are obſtructed, the vapour of vinegar upon hot iron will be profitable. If the head is heavy and dull, the vertex ſhould be anointed with balſam of Peru, which

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may be made ftronger with oil of amber. To preferve the mouth, troches may be held therein, made with [illegible] and olibanum.

To preferve the fauces and windpipe, it is common to take raifins fteeped in fpirit of anifeed.

Of the OZÆNA.

THE ozæna is a fordid ulcer affecting the noftrils; wherein the humour is very acrid or corrofive, intolerably fetid, fanious, and often mixed with a bloody mucus.

With regard to the cure, the leaves of tobacco, or tobacco ointment, are very ufeful: If it gathers to a cruft, it may be removed by oil of fweet almonds. Some make ufe of the fumes of cinnabar, or inject mercurius dulcis; others ufe precipitate mixed with an emollient ointment, and applied with tents. Some ufe an injection of oil of fweet almonds, an ounce with a dram of oil of caftor to foften the acrimony of the humours. If the pain be great, they add a fcruple of camphor and faffron, with half a fcruple of opium. To take away the cruft, they make a powder of rofemary and lavender flowers, dried lemon-peel, and common fnuff.

When the matter is well digefted, the running abated, and the pain gone, it may be cicatrifed with lotions, and wafhed with warm milk.

Of WATCHING.

WATCHING is produced by too great a determination of the nervous fluid to the organs of the fenfes: from its too great influence in the brain, while the lower parts are obftructed with colds or other caufes, as in hypochondriac, melancholic, and mad patients, whofe lower parts are cold: by any irritating body, in whatfoever part it is placed, which difturbs the fenfes, and efpecially the brain: from too great a motion of the humours, while the paffages of the brain are open: from diforders, in which the caufes above-mentioned are predominant; as fevers, phrenfy, melancholy, pains, fuppurations, and fuch-like diforders.

When the caufe is known, it muft be removed, if poffible; and the irritated fpirits muft be appeafed with emulfions, efpecially of poppy feed, or with the thebaic tincture, or theriaca and other opiates in general, not neglecting the original difeafes. In fevers, a moift foftening diet is beneficial; as alfo preparations of barley, emulfions of poppy-feeds, and almonds, decoction of fcorzonera-roots, almond cream, and winter-flummery, ufed as aliment; likewife tea made of cowflip-flowers, and gentle laxatives. When the patient is reftlefs and wakeful the night before a crifis, no hypnotics fhould be given.

When there is no other difeafe, the patient fhould fhun all care, and intenfe thinking, efpecially in the evening; he fhould ufe exercife, and eat light fuppers. If it is caufed by pains, they fhould be appeafed by antifpafmodics, things which temperate, and diaphoretics: if thefe will not do, mild opiates muft be added. In old perfons, all care and folicitude fhould be banifhed, the mind fhould be quiet, and the moderate ufe of generous wine may be allowed in the evening; likewife medicines of amber and mufk will be proper, and confectio alkermes or theriaca with wine. The drinking of hot water, and principally coffee, muft be forbid after dinner.

Of the INCUBUS, *or* Night-mare.

WILLIS obferves, that the incubus rarely feizes any one, except during fleep, and when the ftomach is oppreffed with aliment of hard digeftion, efpecially if the patient lies on his back.

Thofe that are feized with it, feem to have a heavinefs on their breafts, and about their præcordia; and, if they want to fpeak, they cannot: fometimes they fee fpectres of various forms, and cannot get rid of the load, or move their body, but after a long ftruggle: at length they awake, and the imaginary weight vanifhes; but fometimes they find a tremor of the heart, and many times a quick and violent vibration of the diaphragm.

Heifter obferves, that thofe who have troubled dreams, or walk in their fleep, are to be cured in the fame manner, as proceeding from the fame caufe, and fhould purge, bleed, and ufe a fpare diet.

Etmuller is much of the fame opinion, and advifes the patient to eat flight fuppers, and to lie with their heads raifed pretty high. If it be very troublefome, anti-epileptics may be ufed, as well as medicines prepared of fteel. It frequently affects children, becaufe they eat more than they can digeft. There are fome inftances of its being mortal, though it is generally without danger. Dr White has proved that the incubus is owing to wind in the ftomach and bowels; and therefore recommends a dram of brandy before going to bed.

Of the SYNCOPE, *or* Fainting.

HEISTER obferves, that this diforder may arife from want of ftrength from profufe bleeding, from fudden and violent terror and dread, or from the fight of any greatly affecting thing. The patient is deprived of fenfe and motion, either wholly or in part, with palenefs of the face, and a very weak or low pulfe. They are generally roufed by fhaking and pulling, or by volatile medicines; which diftinguifhes it from the apoplexy.

There are two kinds; the one flight, the other grievous. The flight kind is attended with palenefs of the face, difturbed vifion, finging of the ears, and fometimes with a vertigo; the ftrength fails, and the patient is almoft deprived of fenfe, falls or finks down, till fome proper remedy is applied to the nofe and mouth. The more grievous fort is, when the patient falls into a delirium, and is deprived of all fenfe and motion, except breathing, and a very fmall pulfe; but yet he may be rouzed by fpirituous medicines and other means, much more eafily than in the apoplexy.

Befides the caufes already mentioned, there may be added the hyfteric paffion, which feems to proceed from fpafms; fome of this fort are thus affected with the fmell of fweet things. Some incur this diforder by deep ftudy, great inanitions, and fafting.

With regard to the prognoftics, it has generally more terror than danger attending it, unlefs it proceeds from profufe bleeding, or wounds, or a lofs of ftrength by o-

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ther diſeaſes, or a moſt violent terror. The ſlighter fainting-fits have little danger; and patients are brought to themſelves by volatile medicines, taken by the mouth, or applied to the noſtrils.

As to the cure, if the ſlighter ſort happens when a vein is opened, or from the ſight of blood, wounds, ulcers, or any chirurgical operation, which proceeds from horror and fear, affecting the imagination, it often happens that changing the room, and going into freſh air, will perform a cure. But if any thing hinders this, that they can neither walk nor leave the room, the ſmell of hungary water alone, or volatile ſpirits, or wine and ſtrong vinegar, or ſprinkling the face with cold water, or a draught of generous wine, will bring them to themſelves.

In more grievous fainting fits, where gentle cordials are of little uſe, the ſtronger ſort muſt be applied, ſuch as ſpirit of ſal ammoniac to the noſtrils, temples and pulſes, with ſtrong frictions; or 40 or 50 drops of volatile ſpirits may be given inwardly, to which may be added cinnamon water, orange-flower-water, or the like; not forgetting a draught of generous wine, with vellications and frictions of the extremities of the noſe, ears, head, hair, *&c.* till they recover.

When the patient is hyſteric, none but fetid things ſhould be applied to the noſe, ſuch as caſtor, aſa-fœtida, partridges feathers burnt, or burnt leather, horn, or the like; as alſo fetid ſpirits, in a grievous fit; not omitting vellications and frictions of the aforeſaid parts.

Of the SPASM *of the* LOWER JAW.

IN the ſpaſm of the lower jaw, when the patient can neither open his mouth, nor eat, as when perſons are wounded, and ſomething foreign is lodged therein, or when the nerves are hurt, or when ſharp things, ſuch as vitriol, are applied to ſtop the blood, the cure muſt be performed according to the diverſity of cauſes, as particularly treated of in ſurgery. But when this happens ſpontaneouſly in infants, they generally die, though the beſt nervous and antiſpaſmodic medicines have been uſed both inwardly and outwardly.

Of the CYNIC SPASM, *or* Convulſion *of the* Muſcles *of the* Mouth.

A CYNIC ſpaſm, if it proceeds from vegetable poiſons, as it generally does, they are to be expelled immediately from the body by a vomit, and then giving generous wine, warm with ginger or pepper. If it happens from other cauſes, it muſt be treated with antiſpaſmodics and nervous medicines, both inwardly and outwardly; and chiefly with plaſter of betony and bay-berries, prepared with oil of amber, and applied to the temples, and behind the ears.

Of the PALPITATION *of the* HEART.

THE heart often palpitates ſo much as to be heard at a diſtance by the by-ſtanders, which they ſuppoſe to be an affection of the thorax. This may ſometimes happen, from a violent motion of the body, chiefly when aſcending high places, and principally in thoſe who are plethoric and hypochondriac Sometimes it is cauſed by fear or dread, when the blood is forced too violently to the heart. When it proceeds from violent motion or terror, and returns often, it cauſes a kind of polypus, as is evident from the diſſection of thoſe bodies who have died of this diſeaſe. Hence, almoſt a continual palpitation ariſes. Sometimes it proceeds from a bad conformation of the heart and the neighbouring veſſels, ſuch as an aneuriſm of the aorta, when it becomes boney.

Others affirm, it ſometimes may be cauſed by wounds in the ventricles or abſceſſes in the heart; or from wind, or a diſorder of the animal ſpirits, inducing ſpaſmodic affections.

In the beginning of the cure, if the patient is plethoric, or when uſual bleedings have been ſtopt, it will be proper to bleed, by way of preſervation, in the ſpring and autumn.

Beſides this, ſaline, nitrous, and cinnabarine temperating medicines are to be uſed, particularly antiſpaſmodics, to appeaſe the motion of the heart, and render the blood more fluid. The aqueous infuſions of tea, balm, veronica, primroſes, or citrons, are likewiſe proper, eſpecially with the eſſence of ſcordium, carduus benedictus, citron, or orange-peel, with a little dulcified ſpirit of nitre, taken morning and evening; as alſo temperate pediluvia, moderate frequent exerciſe, riding, moderate diet, plenty of thin drink, whey, mineral waters, eſpecially the chalybeate kind, are very uſeful in this diſeaſe.

Of a POLYPUS *of the* HEART.

A POLYPUS is a maſs compoſed of various pellicles and fibres, generated in the heart and large veſſels. They are generally founded in acute as well as chronic diſeaſes; and there are few bodies to be met with, wherein they are not to be found after death. Its principal ſeat is in the heart, pulmonary artery, and the aorta.

They principally attack the ſanguine conſtitutions, and patients who have ſmaller veſſels, ſoft fibres, of a ſedentary life, who drink little, or are free in the uſe of acid wines and ſpirituous liquors, as alſo thoſe who eat large ſuppers.

The beginning of a polypus may be known by a compreſſion of the breaſt, a fixed pain about the heart, and when it increaſes there is a frequent palpitation of the heart, from a ſlight cauſe, and the pulſe is ſtrangely unequal and often intermits. When there is a violent motion of the body, or the patient has taken a medicine which diſturbs the blood, or the mind is violently affected, a ſhortneſs of breath and an incredible anxiety of the heart will ariſe. Laſtly, there are frequent faintings without any evident cauſe, or from a certain poſition of the body. If the blood is let fall into hot water, it will congeal like jelly, and cleave into white filaments.

In the cure, an exact regimen and diet muſt be made uſe of, with a frequent exerciſe and motion of the body, and mineral waters, eſpecially thoſe of the chalybeate kind, and abounding with alkalious ſalt.

Of the HICCUP.

A HICCUP is a ſpaſmodic affection of the ſtomach and diaphragm, ariſing from any thing that irritates and vellicates their nervous coats. When it proceeds from a ſlight error in diet, it will ſoon end ſpontaneouſly, or by drinking any thing which dilutes the acrid matter. Sometimes

it is of a more grievous kind, and may proceed from a hurt of the ſtomach, poiſon, an inflammation of the ſtomach, inteſtines, bladder, diaphragm, or the reſt of the viſcera. Sometimes, immediately before death, it may proceed from gangrenes of the outward parts. In acute fevers, and chiefly the malignant, a hiccup is frequent, and often fatal.

When it happens in old or weak perſons, from a plentiful meal, eſpecially from hard and flatulent aliment, a draught of generous wine, or a dram of any ſpirituous liquor, will generally take it away. Likewiſe ſtomachic powders mixt with Peruvian bark, and taken in generous wine, are profitable; as alſo if it proceeds from cold, or drinking cold liquors.

When it proceeds from other cauſes, eſpecially from acid humours in the ſtomach, abſorbent and alkalious medicines are good. If it proceeds from an acute fever, or an inflammation of the ſtomach, it is a dangerous diſeaſe. However, dulcified ſpirit of nitre, joined to an alexipharmac, and given often, is proper; a dram or two of diaſcordium, given in the evening, may perform a cure. If it proceeds from a gangrene or mortification, it is generally incurable; but Peruvian bark, with medicines againſt internal inflammations, is moſt likely to ſucceed. If a poiſon is the cauſe, plenty of milk muſt be taken with oil, as has been already taught.

Of the Soda, *or* Heart-burn.

This diſorder is a heat or troubleſome burning about the pit of the ſtomach, or its left orifice, which ſometimes is extended the whole length of the oeſophagus, with a preſſure or ſpaſmodic conſtriction, uſually attacking the patient by fits. The cauſe is generally fat aliment, if cold drink be taken ſoon after. In ſome it proceeds from acids, in others from aromatics, ſpirituous liquors, or bilious humours. It frequently torments pregnant women. This diſorder is generally ſlight, and vaniſhes of its own accord; but in ſome it is of long duration.

In the cure, the cauſe muſt always be attended to: If from acids, abſorbents are proper, particularly crabs-eyes and prepared ſhells, mixed with a fourth or fifth part of powder of nutmeg, given to half a dram. It is common to take chalk alone, or mixed with nutmeg; but care ſhould be taken not to be too free in its uſe. Oil of tartar *per deliquium*, given from 20 to 30 drops, in tea, coffee, broth, or warm beer, is uſually efficacious; as alſo tincture of tartar and ſpirit of hartſhorn. If it proceeds from bilious humours, 30 or 50 drops of dulcified ſpirit of nitre in water, tea, or coffee, will take away the pain. When it is cauſed by fat things, and draughts of cold liquor, a dram of brandy is good. Now and then laxatives ſhould be given, to carry of the humours. In ſanguine conſtitutions, bleeding may be proper.

Of the Cardialgia, *or* Pain of the Stomach.

Of all pains of the ſtomach, the cardialgia is the moſt ſevere. It is a ſpaſmodic pain of the orifice of the ſtomach, ſometimes of the right and ſometimes of the left. One kind of this diſorder may proceed from a ſharp cauſtic, or poiſonous matter; ſometimes it ariſes from a redundant or cauſtic boil, or from a dyſentery. At other times it may proceed from the blood, when any uſual evacuations are ſuppreſſed, and the nervous membranes of the ſtomach are diſtended thereby. Hence it often happens to women after the fiftieth year; and, in the cure, bleeding or ſcarifications are proper: on the other hand, if it is deduced from a cauſtic matter in the ſtomach, oily appeaſing things, aſſes milk, an infuſion of camomile flowers, cream, with abſorbents, are proper. It muſt be diſtinguiſhed from a painful inflation of the ſtomach, in which there is a tumour like a bladder under the falſe ribs, chiefly on the left ſide, and under the pit of the ſtomach; but the inflation is generally on the right ſide, with great difficulty of breathing. This is common in infants before they are weaned; but more ſo in hypochondriacs, if they are too luxurious.

If it proceeds from the remains of the aliment grown ſharp, whence flatulencies ariſe, it generally gives way to tea or coffee alone, or a decoction of camomile flowers, eſpecially mixed with ſtomachics; likewiſe preparations of fennel, aniſe, orange peel, and other carminatives are uſeful; as alſo a dram of the powder of orange peel, or camomile-flowers, with a few grains of ſaffron, in an ounce or two of wine.

When the ſtomach is too much filled with aliment difficult of digeſtion, or fat things, a gentle emetic will be neceſſary, eſpecially if there is a nauſea or reaching to vomit; after which, a ſufficient quantity of warm water muſt be drank, to waſh the ſtomach: this will be beſt promoted with a decoction of carduus benedictus, or half a dram of tartar-vitriolate, ſalt of worm-wood, and the like; after which ſtomachics muſt be given.

In a very violent cardialgia, from congeſtions of blood, vomits are improper, but bleeding neceſſary, with antiſpaſmodics of tartar-vitriolate, nitre, cinnabar, crabs eyes, and the like, in a proper vehicle; as alſo ſpirit of hartſhorn mixt with tincture of tartar to 50 or 60 drops. To theſe may be added emollient and anodyne clyſters, and a bladder of hot milk, with camomile flowers, applied to the pit of the ſtomach.

Of Flatulencies *and* Eructations.

The cauſe of theſe diſorders is generally a weak ſtomach, and crude flatulent aliment, ſuch as peaſe, beans, lentils, coleworts, turnips, radiſhes, hard fat fleſh, and the like; which degenerate into wind, creating great anxiety, if not evacuated, and difficulty of breathing. It is a diſorder familiar to hypochondriacs, and, the ſtomach being ſtrongly contracted, the wind breaks out with violence.

Another cauſe of flatulencies are congeſtions of blood in the branches of the vena portæ; whence proceed anxieties of the præcordia, difficult breathing, colic pains, and the cardialgia, and, by conſent of the ſtomach with the head, pains in the head, the vertigo, and watchfulneſs.

If it ariſes from crudities in the ſtomach, evacuations are neceſſary firſt of all; and then ſtrengtheners, aromatics, bitters, and carminatives, ſuch as have been mentioned in the preceding diſeaſes; with a ſparing diet and excerciſe.

If it proceeds from congeſtions of the blood in the branches of the vena portæ, which is the caſe of hypochondriacs, or when uſual bleedings are ſuppreſſed, a vein muſt

muſt be opened; if the body is coſtive, an emollient clyſter or a gentle laxative will be proper. If theſe fail, chalybeate medicines muſt be uſed, ſuch as the tincture of vitriol of mars, ſteel-filings finely powdered to 6, 8, or 10 grains, or oil of cinnamon with ſugar, or bitters, or ſpaw-waters, with conſtant exerciſe.

Of Worms.

Worms are various with reſpect to their ſhape and magnitude, and have their ſeat in the ſtomach and inteſtines. The round are furniſhed with a proboſcis, and a kind of crooked claws, wherewith they ſometimes gnaw and tear the membranes. If theſe lodge in the ſtomach, their bites are attended with an inexpreſſible pain, anxiety, inquietude, nauſea, and flux of ſpittle; a fetid ſmell exhales from the mouth; the countenance is now pale, and then red; there is an itching of the noſtrils, with an inclination to vomit, and a dry and troubleſome cough by fits, and ſometimes fainting.

When they are contained in the inteſtines, eſpecially the ilion, then they produce the following ſymptoms. The belly is ſtrangely diſtended, eſpecially in infants, and they ſeem to be afflicted with the tympany, with now and then a diarrhœa, and the fæces are of an aſh-colour, not unlike cow dung; the upper parts waſte away, inſomuch that the bones are viſible, and yet the appetite is great. The face is generally pale and tumid; the excrements ſeem to be full of cucumber-ſeed, or the like.

The ſigns of the aſcarides are as follows: Their ſeat is chiefly in the groſs inteſtines, and they are moſt plentiful in the rectum. They are like book-worms, and are thrown out in large quantities. They have many things in common with the other inſects, and produce inflation of the belly, leanneſs, and a nauſea; they are attended with a great itching of the anus, and cauſe fetid excrements.

The broad worm, called tænia, is like a narrow tape two or three ells long, or longer, divided through the whole length with croſs joints or knots. Andry affirms, that there is only one in the body at a time, and therefore is called ſolium.

The Greeks called the remedies againſt worms anthelmintics; the moſt approved of which are aſa-fœtida and ſagapenum, eſpecially if mixed with purges, ſuch as mercurius dulcis, and extract of rhubarb in pills; with this caution, that before and after the uſe of them, a few ſpoonfuls of ſalad oil, or oil of ſweet almonds ſhould be taken, for all things of that kind are of great uſe. The ſeeds of cina, ſantonicum, and tanſey, are likewiſe uſeful, by reſiſting the putredinous colluvies, and reſtoring the tone of the inteſtines.

Some affirm, that bitters are good remedies, as the tops of wormwood, the leſſer centaury, ſcordium, and flowers of tanſey; likewiſe Peruvian bark, and eleutheria, in beer or wine, chiefly canary, in which ſome ſpoonfuls of the infuſion or decoction ſhould be taken every day. Aloes, myrrh, and corallina, are likewiſe powerful medicines in a proper vehicle, or with honey, in the form of an electuary. The freſh juice of water-creſſes, taken every morning for ſome days, is likewiſe proper.

The filings of ſteel diſturb the lumbrici and aſcarides; as alſo Spaw waters; likewiſe ſpirit of vitriol or ſulphur, and the elixir of vitriol: Wine itſelf is not a bad thing drank at meals.

Medicines of quickſilver are likewiſe good, eſpecially half an ounce of it boiled in a pint of wormwood water, in a glaſs-veſſel, for half an hour, ſtirring the quickſilver with a ſtick: the doſe is a ſpoonful for a boy, often in a day: an adult may take three, in an ounce or two of ſolutive ſyrup of roſes; or it may be boiled in milk, if the children prefer it.

If theſe fail, a purge ſhould be given every third or fourth day; ſuch as mercurius dulcis, with aloes, diagridium, reſin of jalap, or troches of alhandal.

When internal things are rejected, the belly may be anointed with oxes gall made hot, two or three times a-day, or with oil of coloquintida, or of wormwood, with diſtilled oils of wormwood and tanſey, to which the decoction of quickſilver with milk may be added.

To kill the aſcarides, chalybeates are good, and mercurial purges, with clyſters of a decoction of wormwood, ſeeds of cina, myrrh, and quickſilver, to which may be added an ounce and a half or two ounces of oil of wormwood made by decoction. Or the clyſter may be of ſalad oil, or oil of ſweet almonds, or linſeed alone, and injected often.

The powder of tin has been uſed many years as a remedy againſt worms, and particularly the flat kind which often elude the force of other medicines; but the ſucceſs of this depends upon the proper doſe, and then it will have remarkable effects.

Take an ounce and an half of pewter, and grind it to a fine powder, and mix it with half a pint of treacle.

To adults give two ounces of the powder of pure tin, ſifted through the fineſt hair ſieve, mixt with eight ounces of treacle, after the patient has been purged with an infuſion of ſena and manna.

Of Difficulty *or* Suppression *of* Urine.

Difficulty of urine ariſes generally from a ſtone, or from an inflammation of the kidneys or the neck of the bladder. In ſanguine perſons, it may proceed from the ſuppreſſion of ſome uſual hæmorrhage, or from the blind piles; or there may be a congeſtion of blood in the ſpungy or cavernous part of the urethra, which may be ſo diſtended and inflated, as not to tranſmit the urine, or at leaſt with great difficulty. In ſome it may be owing to a ſpaſm of the neck of the bladder, or to ſharp urine; in others to a palſy of the bladder, or a caruncle of the urethra; or from a tumour, abſceſs, or ulcer, in the proſtrate gland; or from its being too large, or indurated, as often happens. Likewiſe in bloody urine it is not ſeldom ſuppreſſed; at leaſt it is expelled with great pain and trouble, which proceeds from a concretion of blood. Etmuller affirms, that a dyſury is generally occaſioned from the want of mucus of the urinary paſſage, or its being worn off.

As the cauſes of an iſchury are various, they ought to be carefully diſtinguiſhed from each other. When it proceeds from an inflammation of the kidneys, the pain and heat are principally in that region, attended with a fever; if from a ſtone in the kidneys, it is accompanied with vomiting; if from a ſtone in the bladder, there is a violent pain

pain in the bladder, which is extended to the very extremity of the urethra; a mucus or pus is excreted with pale urine; and, upon proper examination, the ſtone may be felt; but the moſt certain ſign is ſearching the bladder with a catheter. When this diſorder ariſes from a ſtone in the urethra, it may be eaſily felt. If from an inflammation of the neck of the bladder, there is a tumour and pain in the perinæum: but it may be beſt perceived by thruſting the finger into the anus, and turning it up towards the bladder; for a tumour will be perceived by the phyſician, and by the patient a burning and preſſing pain; and when a catheter is introduced into the urethra, an impediment will be felt near the neck of the bladder, which will hinder it from proceeding further. To theſe ſigns may be added, when the diſorder is great, a teneſmus, a conſtriction of the anus, an anxiety of the præcordia, coldneſs of the extreme parts, vomiting, and a frebile pulſe. When the cavernous ſubſtance of the urethra is too much diſtended with blood, and the urine is ſuppreſſed, a ſilver pipe cannot be admitted into the urethra, eſpecially if the patient abounds with blood. When there is a ſpaſm in the neck of the bladder, it appears from the cauſes aforeſaid; and likewiſe the patient perceives a ſpaſmodic conſtriction about the neck of the bladder, and a catheter will paſs thereto, but no farther; and there are no ſigns of a ſtone in the urethra or bladder.

If the urine is ſharp, and produces a ſpaſm, we may diſcover it from its being very ſtinking, eſpecially if the patient is old or ſcorbutic; and there are many ſaline particles in the urine like lime. When there is a caruncle in the neck of the bladder, it may be known from the ſigns mentioned in the lues venerea, where the cure is treated of. An abſceſs in the proſtrate gland often is miſtaken for a caruncle. When a ſcirrhus of the proſtrate gland is the cauſe of a ſupreſſion, there is a hard or indolent tumour in the perinæum, or at leaſt the pain is not great.

When the urinary paſſages are obſtructed by ſolid bodies, that is, the pelvis of the kidneys, the ureters, or the neck of the bladder, or the urethra, from a ſtone contained therein; if it be ſmall, diuretics will be proper, which are mentioned in a fit of the gravel or ſtone; to which may be added a decoction of eringo-root and Epſom ſalt or Selters waters taken often therewith. But if the ſtone is large, and cannot be excreted by this means, ſtrong diuretics are highly hurtful, and it muſt be cured by ſection; (ſee SURGERY.) But if the patient is too weak, or too old, and cannot undergo the operation, the ſtone, if poſſible, muſt be driven back; and the pains muſt be appeaſed with antiſpaſmodics internally, and with lenients, lubricant and oily medicines, as well as gentle anodynes: Externally, with emollient clyſters, ointments, liniments, and baths. If the pains are violent, lenient injections may be thrown up into the bladder, of ſalad, linſeed, and white poppy oil, or oil of ſweet almonds, or a decoction of linſeed or roots of mallows in milk, with the addition of a little freſh butter. This done, the patient muſt have recourſe to lime-water.

If the urine is ſuppreſſed from an inflammation of the kidneys or bladder, diuretics are pernicious, and mineral waters not ſafe; but rather refrigerating nitrous remedies, neutral ſalts, crabs-eyes, tartar-vitriolate, may be given, with a grain of camphor in every doſe. To render them more efficacious, they may be joined to a decoction or infuſion of parſley-roots, eringo-tea, ground-ivy, or the like; likewiſe emulſions of the four colds ſeeds, with crabs-eyes, calx of antimony, and nitre, or ſeeds of violets, which are laxative and gently diuretic: to theſe may be added fomentations, and a bladder filled with hot milk or water, or emollient and reſolvent cataplaſms, applied to the region of the kidneys or bladder, or perinæum, according to the place of the inflammation, as well as baths of the ſame kind: but above all, bleeding is neceſſary, eſpecially in the plethoric, and the promoting of uſual hæmorrhages. In the mean while aperients and reſolvents muſt be given, ſuch as powders of crabs-eyes, arcanum duplicatum, tartar-vitriolate, and nitre; or medicinal waters, with bitter cathartic ſalts given now and then.

When the ſpungy ſubſtance of the urethra is ſwelled with blood, and as it were inflated, a copious bleeding is the principal remedy.

When a ſpaſm affects the neck of the bladder, it muſt be treated with temperating and antiſpaſmodic powders, diuretic waters, and infuſions, with emulſions, or lenient oils now and then, ſuch as ſalad-oil, oils of ſweet almonds, poppy or linſeed: externally, cataplaſms, ointments, clyſters, and baths, of the emollient and demulcent kind; with gentle opiates, if the diſeaſe requires them.

If the ſpaſm proceeds from a ſharp urine, from the ſurvy, or otherwiſe, it muſt be treated with gentle purges and diaphoretics, and abſorbents, ſuch as crabs-eyes, mother of pearl, prepared chalk, calx of antimony, and amber; with lenient decoctions of china root, ſarſaparilla, or mallows, with emulſions and demulcent oils; to which may be added ſyrup of marſh-mallows; when the pains are violent, they muſt be appeaſed with moderate opiates.

If the difficulty proceeds from blood remaining in the bladder, or its neck, the concretion is to be reſolved and expelled with warm infuſions of digeſtive herbs drank like tea, ſuch as ground-ivy, arnica, chervil, or veronica; with tincture of tartar, or liquor of the terra foliata of tartar, with digeſtive powders of crabs-eyes, ſaturated with the juice of oranges or lemons, ſperma ceti, tartar-vitriolate, nitre, and cinnabar: to which may be added the water of chervil or parſley; with roaſted onions applied hot to the region of the pubes, perinæum; or cataplaſms of wheat-flour boiled in milk, with butter and a little ſaffron, or with white lily roots, mallows, marſh-mallows, or camomile flowers applied to relax the ſpaſm of the neck of the bladder; or with a bladder of hot milk, in which camomile flowers have been boiled; with emollient and reſolvent clyſters of camomile-flowers boiled in milk, with oil or freſh butter: but, if all theſe fail, a catheter is to be introduced into the neck of the bladder, to break the concretion, and evacuate the urine.

When there is an ulcer in the bladder, which will appear from purulent and fetid urine, with a moſt violent pain in the bladder, as if a ſtone was contained therein; all ſharp and ſtimulating things muſt be avoided, and the infuſions of vulnerary abſorbent roots and herbs muſt be given with mucilages and ſoft balſamics, eſpecially balſam of Mecca, Tolu, &c. with a moderate uſe of quickſilver, eſpecially

especially if the case is venereal. Then mineral waters may be drank, either alone or with warm milk, for several weeks, or the hot bath waters: to these may be added injections of a decoction of the traumatic herbs, such as agrimony, St John's wort, plantain, or yarrow; or, in their stead, milk with syrup of marsh-mallows, or fresh butter, or oil of St John's wort.

If there is a difficulty of urine in pregnant women towards the last months, diuretics must be shunned. The best remedy in this case is to ease the pressure upon the part; but, if that will not do, to use a catheter.

Lastly, if it proceeds from a swelling of the prostate gland, or if it is become scirrhous, it must be treated as such, as will be hereafter taught.

But, if these remedies will not do, the bladder must be pierced with a trochar, which is called the puncture of the perinæum; and, when the perforation is made, the water must be evacuated, as in the dropsy: The instrument must be left in the wound, and be fastened in such a manner that it does not fall out, that so the urine may be made as often as there is occasion: It is a troublesome operation, but the only one left.

Of the Diabetes.

A Diabetes happens when the urine comes away crude, exceeding the quantity of liquids drank, attended with weakness, which generally proceeds from the kidneys, which are too weak and lax, especially in those who have been accustomed to drink too much. Heist.

Lister observes, that a diabetes comes slowly on, and is a long while in breeding. In the beginning, the mouth is dry, and the spittle a little white and frothy; the urine being somewhat more than usual, with a small thirst. A heat begins to be perceived in the bowels, which is a little pungent; the patient falls away, and the mind is anxious and unstable. In time the thirst greatly increases, the urine is plentiful, and the body wastes. When they make water without intermission, the thirst becomes intolerable; and, though much is drank, it is not proportionable to the water. When the urine is retained a little while, there is a swelling of the loins, ilia, and testes, and it comes away with pain. Now death is at hand. The urine is pale, not sweet, but it is more sweetish at last than at first.

Strengtheners, moderate astringents, and species of hyacinth, with crocus martis, are good in this disease, especially with anodynes: or Japan earth, or the tincture of vitriol of mars, red wine with water in a small quantity: the drink should be sparing, and all excesses avoided. Exercise and frictions of the body are likewise profitable, because they strengthen the parts, and increase perspiration.

Lister says, almonds and a milk diet are proper in this distemper; as also wine with ginger; allowing in the mean time a draught of milk and water to allay the thirst.

Willis declares, he has often prescribed tincture of antimony with good success; and lime-water with sassafras, aniseeds, raisins, or liquorice.

Of WOMENS DISEASES.

Of the Chlorosis, *or* Green-Sickness.

Sydenham looks upon this to be a species of the hysteric affection, and is known by a paleness and discolouration of the face and the whole body. The complexion appears a little sublivid or greenish, with a red or dark circle under the eyes; the face is bloated, the eyelids and ancles are apt to swell; the whole body is heavy and dull; there is a tensive lassitude of the legs and feet, difficulty of breathing, palpitation of the heart, pain of the head, a feverish pulse, a drowsiness; a pica, or desire of eating unfit things, such as coals, chalk, *&c.* and a suppression of the menses. The clavus hystericus often attacks patients in the height of this disorder.

The cure is to be attempted with chalybeate medicines, such as are prescribed in the hysteric disorder, given according to the patient's age, drinking wine after them; or the corroborating infusion with angelica root. If the patient is not very weak, she may be purged once or twice before the course is entered upon.

Heister recommends attenuants, evacuants, and strengtheners, with a good diet and exercise; particularly from v to viij grains of powder of steel, with half a scruple of a proper elæosaccharum, or with bitter extracts given in the evening; as also emmenagogues at due times, with pediluvia and bleeding in the foot about the time of menstruation. If these will not suffice, he thinks matrimony a certain cure.

Of the Suppression *of the* Menses.

As soon as a healthy female arrives at her full growth, she generates more blood than can be conveniently contained in the vessels; wherefore the superfluity is evacuated by the uterine arteries, and is called the *Menses*.

Boerhaave observes, that in a suppression of the menses there is a plethora, with a listlessness to motion; a heaviness, a paleness, a pain of the loins and of the groin; all the functions, whether natural, vital, or animal, are depraved. Sometimes the menses will force a way thro' the eyes, ears, nostrils, gums, the salival ducts, bladder, breasts, skin, wounds, or ulcers.

Hence often arises a depravation of all the viscera, as also diseases without number, partly from a putrefaction already begun, and partly from the hurt which the vessels have received.

From this disorder proceed want of appetite; the pica and malacia, or a depraved appetite. If it is habitual and obstinate, a scirrhus or dropsy of the womb are to be feared, or a rupture of some blood-vessel, especially of the lungs. It is not so dangerous when the uterus is not infarcted, or when there is no other symptom of the menses. If this disease is attended with the fluor albus, it may become habitual, and from yellow become green and acrid, corroding the uterus, and laying a foundation of a dropsy therein

Things which retard the menses are, immoderate cold, sorrow, a sudden fright, too great evacuations, incrassating

ting diet, a crudity of the humours, acids, and aſtringent medicines.

This diſorder is to be cured in the ſame manner as the hyſteric affection; but, if the remedies for that fail, the patient muſt take every morning five ſpoonfuls of an hyſteric julep, with twelve drops of ſpirit of hartſhorn; and every night a ſcruple of compound powder of myrrh made into a bolus, or pills with ſyrup of lemons. Allen recommends cantharides and camphor; the doſe is from two grains to ſix.

Hoffman directs chalybeates, or pills made of aloes, myrrh, ſaffron, amber, caſtor, and round birthwort. Pitcairn thinks mercury more efficacious than ſteel.

If the fluids are inclinable to ſtagnate, their fluidity may be preſerved by fomentations and frictions of the feet; by opening a vein in the foot, and bleeding elſewhere; by giving uterine purges; by emmenagogues; by plaſters, fomentations, liniments, vapours and heat; by ſtrengthening the veſſels debilitated with a plethora, by chalybeates and aſtringents.

Uterine cathartics are aloes, myrrh, bryony, colocynthus, gum-ammoniac, bdellium, ſagapenum, opopanax, aſa-fetida, galbanum, and elixir proprietatis.

Emmenagogues, beſides the former, are, ariſtolochia, mugwort, motherwort, camomile, juniper, marjoram, marum, feverfew, pennyroyal, rue, ſavine, ſage, elder, wild-thyme, tanſy, thyme. To which may be added balm, roſemary, wall-flowers, ſaffron, bay and juniper berries, amber, rhubarb, and aromatics. As alſo borax, alkaline and volatile ſalts; warm, ſtimulating, acrid, and aromatic oils; the barks of guaiacum, ſaſſafras, cinnamon, and juniper; the rinds of oranges, citrons, and lemons.

Reſolving plaſters are thoſe of cummin, melilot, galbanum, bayberries, labdanum, oxycroceum, which muſt be applied to the ſoles of the feet, navel and groin. The fomentations may be made of Venice ſoap, and ſome of the above mentioned herbs.

Of the Immoderate Flux *of the* Menses, *or* Uterine Hæmorrhage.

Every large flux of blood from the uterus is not to be eſteemed noxious, but ſuch only as is attended with loſs of ſtrength, which brings on other ſymptoms, ſuch as want of appetite, crudities from indigeſtion, a ſenſation of weight near the regimen of the ſtomach, an ill colour in the face, a languid pulſe, often with a gentle heat, an œdematous ſwelling of the feet, and a diſturbed ſleep without refreſhment.

Sometimes the menſes flow in too great plenty and with impetuoſity at the uſual period; ſometimes twice or oftener in a month; ſometimes again they continue ſeveral days longer than ordinary.

This flux ſometimes conſiſts of thin florid blood, which happens chiefly in abortions; and from a retention of pieces of the ſecundines, which keep the mouths of the veſſels open. Sometimes there are coagulated and clotted maſſes like fleſh come away with the blood, of the ſize of an egg, which is occaſioned by a ſtoppage of the menſes for two or three months. At other times the blood is grumous, coagulated, and black; generally on the firſt days of child-bed, in ſlender and plethoric ſubjects. When the patient is cachectic, and the flux continues long, it is thin, watery, and mucid. In the ſcorbutic, it is corrupt and fetid, with acrimony and pain. In the younger ſort, before child-bearing, if the evacuation be immoderate, it is commonly followed by a fluor albus, or the dripping of a white, impure, mucid matter.

The cauſe may be referred to a copious and impetuous afflux of blood to the uterus, and an unequal and impeded reflux by the veins; which diſtending and relaxing the uterine veſſels, make the orifices too wide, or rend and corrode them, by which the blood flows too freely. This may happen from a plethora, or when there has been a long ſuppreſſion, or an abortion, or a difficult labour. It generally happens to women about the fiftieth year, when the menſes are going to leave them; and not always without danger. It ſometimes happens to women upwards of ſixty, which, if attended with a ſlow fever, haſtens death.

The concomitant ſigns are generally theſe: A tenſion and inflation of the hypochondria, a heavy preſſing pain about the loins, ſometimes with a chilneſs; a coldneſs of the extremities, a ſinking of the veſſels, a paleneſs of the face, a quick pulſe, with an internal heat, a coſtiveneſs, and little urine; all which ſhew there is not only a debility and laxity of the uterus, but ſpaſmodic ſtrictures of the vaſculous and nervous parts, which force the blood to the uterus.

If the body is cacochymic or ſcorbutic, or full of bad humours, or afflicted with the venereal diſeaſe; when the viſcera are unſound, and the liver, ſpleen, and meſeraic veins, are ſtuffed with thick blood, the caſe is dangerous and troubleſome; for the fault of the fluids and cachexy continually increaſe: Beſides, the more the ſtrength is weakened, the more the ſtomach and digeſtion are hurt; the blood is depraved, and the excretions diſturbed and leſſened. When this happens to women when the child is dead, their lives are in great danger, and nothing but ſpeedy aſſiſtance from a man-midwife can ſave them. The caſe is alſo dangerous when the ſecundines are violently extracted, or parts of them are retained, and which ſometimes degenerates into moles.

Immoderate evacuations are produced by a ſedentary life, which gives room for abundance of thick chyle and milk. It is cauſed likewiſe by too frequent uſe of ſalt, acrid, and ſeaſoned meats; by ſpiritous liquors, *&c.* by violent agitations and paſſions of the mind, from loſſes, gaming, love, anger, *&c.* It may be obſerved likewiſe, that violent exerciſe does as much harm as the moderate is ſerviceable, eſpecially if the patient is ſubject to this flux from other cauſes; ſuch as immoderate repetitions of the venereal act, eſpecially in women of a delicate conſtitution; too frequent child-bearing.

The cure ſhould reſpect the reſtraining a preſent flux, and the keeping within bounds a future one.

It ſhould be begun with reſt, if convenient, in bed; the patient lying on her back, and ſilent as much as poſſible. Bleed in the arm, according as the conſtitution and ſtrength of the patient, as well as the urgency of the ſymptoms, will admit or require. Avoid ligatures of the limbs. Let the patient fare ſlenderly on veal and chicken-broths,

broths, fiſh ſoups; and drink a ptiſan of nettle-tops, yarrow, and plantane, with orange-peel, or of the greater comfrey; if ſhe be hot and bilious, with linſeed.

If theſe fail, have recourſe to aſtringents.

Of the Fluor Albus, *or* Whites.

The fluor albus conſiſts in the efflux of a whitiſh, lymphatic, ſerous, or aqueous humour, from the matrix.

It is ſometimes white, ſometimes pale, yellow, green, or blackiſh; ſometimes it is ſharp and corroſive, ſometimes foul and fetid: the face is diſcoloured, there is a pain in the ſpine of the back, the appetite is loſt, and the eyes and feet ſwell. Some women have a periodical flux of the whites inſtead of the menſes.

The ſymptoms are, a pain and weight in the loins, which is worſt in the lymphatic flux, as being attended with a ſwelling of the uterus, turbid urine, barrenneſs, a proneneſs to abortion; a loathing of ſome things, and longing for others; indigeſtion; thickneſs and crudity of the blood; whence proceed œdematous ſwellings of the feet by day, and of the face by night; difficult breathing, palpitation of the heart, ſyncope, relaxation of the ligaments of the uterus, a total or partial procidentia uteri: if the flux is acrid and corroſive, it ulcerates the vulva; creates phlyctenæ; which laſt generally proceed from a ſcirrhus or cancer in the uterus; a ſlow fever; dropſies of different parts; of which, or a conſumption, the patient generally dies.

It may be known from a virulent gonorrhœa; becauſe this is attended with pain and an inflammation of the external parts of the pudenda, chiefly about the clitoris; heat, ſharpneſs and difficulty of urine, pain in coition; it makes its progreſs ſooner. If the gonorrhœa is inveterate, it is very like a fluor albus.

Beſides arterial blood, the menſes conſiſt of redundant lymph or ſerum, chiefly from the membranous cells, and ventricles of the glands of thoſe parts of the membrana celluloſa which are more immediately connected with the kidneys, uterus, and ovarium. When this lymphatic ſecretion becomes morbid, it is called the fluor albus. At firſt the parts of the membrana adipoſa of the loins, kidneys, and uterine appendages, are waſted by it; but at length the flux becomes acrimonious, and may melt and carry off all the fat of the body.

The fluor albus ſometimes is diſcharged from the uterine veſſels, and ſometimes from the glands of the vagina: in the firſt caſe it ſtops when the menſes begin to flow; in the latter it continues with them, and pregnant women are not exempted from it.

When this flux is unſeaſonably ſtopped, it cauſes the belly to ſwell, with pains of the loins, ſlow fevers, numbneſs of the joints, and great laſſitude of the body.

When the flux is lacteous, it may be cured in fifteen days. The patient muſt feed ſparingly, uſe frequent exerciſe, and ſleep little. If this is not complied with, ſhe muſt bleed in the arm once or twice a-month, and take purges and emetics, or at leaſt frequent clyſters. The efficacy muſt be aſſiſted with diaphoretics, decoction of the woods, and diuretics.

In the ſemilacteous flux, inſpiſſating and nouriſhing diet will be beſt, ſuch as creams, ſoaps, boiled milk, roaſt meat, jellies, *&c.* milk, or milk turned with a decoction of china, is very good.

Narcotics are highly uſeful, eſpecially if the patient is reſtleſs, or delirious. In the beginning the doſe muſt be ſmall, which may be gradually increaſed.

When the veſiculæ lacteæ are relaxed, the tone muſt be reſtored with hot mineral baths, fomentations and injections of and bathing in the ſame. The ſtream may alſo be conveyed into the vagina with a funnel.

Decoctions of the woods are alſo good as diaphoretics; and diuretics of a decoction of roots of eringo and reſtharrow, with powder of millepedes, or glauber's ſalt.

If the lymphatic flux is attended with a ſcrophulous, ſcorbutic, or venereal taint, theſe diſorders muſt be firſt removed. If the uterine lymphatics are compreſſed by ſcirrhoſities, cancers, ganglions, or the like, regard muſt be had to the cauſes,

In obſtructions of the glands of the uterus, begin with bleeding; then a gentle purge, or an emetic of iij grains of tartar emetic or ipecacuanha. Afterwards, if the patient's conſtitution is cold, attenuating aperients. If ſhe is hot and bilious, with a ſenſible pain in the uterus, cooling broths and apozems, with the addition of crayfiſh; aſſes milk, with a decoction of barley; chalybeate whey, with chervil boiled therein. Gently purging mineral waters, baths, and half baths, are convenient in the ſummer.

Of the Furor Uterinus.

Salacity in women, attended with impudence, reſtleſſneſs, and a delirium, is called the *furor uterinus*.

It ariſes from a too great ſenſibility or inflammation of the pudenda, or parts wherein the venereal ſtimulus reſides, which are chiefly the clitoris and vagina; or the too great abundance and acrimony of the fluids of thoſe parts; or both theſe cauſes may exiſt together.

In the delirium maniacum, the patient is entirely ſhameleſs; in the melancholicum more reſerved, and her folly is confined to fewer objects.

It may proceed from the abuſe of hot aperitives; thus ſal amoniac, borax, and cantharides, have produced it: from powerful emenagogues in hot and bilious conſtitutions; ſometimes from difficult and ſuppreſſed menſes; from remedies given againſt ſterility. Muſk diſſolved in oleum aromaticum, and rubbed on the membrum virile, has raiſed a phlogoſis in the vagina, whence a furor uterinus enſued.

It is difficult to cure in thoſe whoſe menſes are difficult at firſt; in inveterate caſes; in old ſubjects. It is eaſier cured, when the furor uterinus is eſſential, and the delirium ſymptomatic, than when the delirium is eſſential, and the furor ſymptomatic. The maniacal delirium is harder to manage than the melancholic. If it continues a month or two, the fault of the brain becomes obſtinate, for it degenerates into real madneſs.

The indications of cure, are to diminiſh the heat and ſenſibility of the affected parts; to cool, ſweeten, and dilute the blood, and to render it balſamic; or to purſue both intenſions at once.

The firſt indication is anſwered by frequent and copious bleedings, as in an incipent madneſs; even to eight times in

in two days, if nothing forbids; if she faints, there is no danger. She must likewise be purged, as mad folks are, with jalap, scammony, diagrid. The dose must be increased one third, as being hard to purge. Emetics are also good; for they evacuate the bile, which abates the acrimony of the humours. In the intervals, order frequent emollient clysters; to which add half a dram of sal prunella, or a little vinegar morning and night, baths and semicupia; moderate the heat, irritation, and sensibility of the parts affected: as also emollient injections into the vagina, and fomentations, or pessaries of cotton may be steeped therein; sal prunella may also be mixed therein.

Of an Inflammation *of the* Womb.

An inflammation of the uterus appears from extraordinary heat, and a fixed pain in the groin, with an acute fever, a pain in the loins and belly, an inflation of the abdomen, a stimulus to make water and go to stool; heat, and difficulty of urine; tumour, pain, heat, and tension of the hypogastric region; redness of the os uteri, and great heat of the vagina. If the fore-part of the uterus is affected, there is a dysury or heat of urine; if the back part, a tenesmus, frequent faintings and cardialgia, a burning fever; or, if the inflammation is violent, a lypyria, in which the external parts or extremities are cold, and the internal burn, and the pulse is imperceptible; a delirium and phrensy: the breasts swell in proportion as the inflamed uterus.

This disease may be said to be superficial or more grievous and profound. It is easy formed in child-bed women, and frequently accompanies the milk fever; and may be cured in a few days, if rightly managed: But when it is very intense, and attended with grievous symptoms without remission, it kills on the seventh, ninth, or eleventh day; and a white miliary fever generally supervenes, which is the worst omen, for it shews a mortification of the uterus. When this fever happens, there are spastic and painful strictures in the abdomen, the flux of the uterus is stopped, the body is costive, the feet are cold; there is an urging to make water, which is painful; the head looks red, and swells; the eyes shine; drops of blood fall from the nose; the mind is disturbed; the sleep is little, with terrifying dreams: there is likewise most difficult breathing, faintings, convulsions, a phrenetic delirium, which commonly have a fatal tendency.

This disease should be distinguished from an inflammation of the bladder or rectum; which may be done from the place of the pain: in that of the bladder it is superficial, as if it were in the integuments; in that of the rectum it is very deep, as if about the os sacrum; in that of the uterus it is in the middle, with a violent heat in the vagina, if the finger is introduced. If the bladder is affected, there is an extraordinary heat and retention of urine; and a tenesmus, if in the rectum: In the bladder; the pain is precisely on the os pubis; in the rectum, the anus is affected. If these symptoms happen in an inflammation of the uterus, they are more slight.

If the inflammation is not resolved, it generally ends in a mortification, ulcer, or cancer. A mortification soon kills, and the womb and vagina after a dissection appear to be of a blackish brown. If it ends in a suppuration, the disease is of longer date, which generally happens to women not in child-bed: It begins to discover itself about the ninth or tenth day, by the cessation of most of the inflammatory symptoms, which will return about the twelfth with a shooting pain in the affected part.

A gangrene or mortification happens on the fourth or fifth day, and is known by a weak, languishing, and intermitting pulse, and by a sudden cessation of all the symptoms.

If the disease exceeds the time of the former terminations, and the inflammation is superficial, it is apt to turn to an induration or scirrhus; which ulcerating, becomes a cancer, and is incurable. If, about the twenty second day, there is a renitency or hardness, and a dull heavy pain in the region of the uterus, there is a scirrhus formed.

Women in child-bed sometimes have the womb inflamed from the fault of unskilful midwives, or hard labour; or the lochia are stopped by pains, or hysterical spasms, dread, or cold; wherefore proper precautions should be used to prevent it; which may done by keeping them under a gentle diaphoretic regimen, and by allaying the almost febrile heat. Oil of almonds is proper alone, or with a fourth part of sperma ceti, given daily to half an ounce in chicken-broth; externally the whole abdomen should be anointed with oil of dill, camomile and white-lilies, of each an ounce, oil of caraways a dram, or a dram of camphor; laying a warm napkin doubled over the same.

The tumult being thus appeased, the lochia are to be promoted with pills of bitter extracts, temperate resinous gums, and aloes well corrected, of which xv gr. is a dose morning and evening, to be continued from five to eight days. These are also good when the after-birth or part of it is retained.

If there is a fever, the belly is distended with wind, the lochia are retained, and the spasms tend to the upper parts, you must bleed in the foot.

The drink may be chicken-broth, with scorzonera-root, succory, and shavings of hartshorn boiled therein. As also temperating and resolving powders made of crabs-eyes, and their solution, nitre, and sal polychrest. To which may be added clysters of whey, camomile-flowers, mug-wort, sage, *&c.* with honey, nitre, and fat of hens.

In women out of child-bed the inflammation generally happens in the neck of the uterus and the vagina; and then, besides the foregoing things, you must apply epithems to the pubes, uterine injections, pessaries, and suppositories. The epithem may be of arquebusade water four ounces, essence of saffron, camphorated spirit of wine, of each two ounces, nitre a dram, dissolved in elder-flower water; and, as circumstances require, mixed with vinegar, or rue, or scordium, and applied with a double cloth. The injection may consist of asses milk, with flowers of elder, myrrh, and saffron; and a little nitre may be added tothe decoction. The tenesmus may be appeased with emollient half baths, or with an ounce of oil of sweet almonds, and xij grains of saffron, injected into the anus. These remedies are useful in case of a suppuration.

Of

Of the Abscess *of the* Womb.

Abscesses of the womb are either inflammatory, tuberculous, or ſteatomatous.

The ſymptoms of an incipient abſceſs are much the ſame as the inflammation, ſuch as pain, heat, tenſion, *&c.* which intermit for ſome time, and appear again, when the ſuppuration begins; of which the inflammatory is moſt ſenſible, the ſteatomatous the leaſt. When the abſceſs is formed, all the ſymptoms of inflammation vaniſh: but coldneſs of the extremities, a ſlow fever, and maraſmus, gradually increaſe from the abſorption of the pus into the blood.

If no inflammation has preceded, and the patient was ſubject to obſtructions, eſpecially of the glands of the uterus, and had a lymphatic fluor albus, it may be tuberculous; if the tumour is ſoft and indolent, it may be ſteatomatous; but theſe are rare. The place may be partly diſcovered by the touch, but more eſpecially by the complaints of the patients.

If it breaks into the bladder, and paſſes off by urine, or into the rectum, and is diſcharged by ſtool, or into the groin, it is dangerous; if into the abdomen, incurable: If it breaks into the vagina, it may become an ulcer, which is commonly mortal; or the patient may periſh by a hectic fever before the eruption. The tuberculous and ſteatomatous are much the ſloweſt.

The work in this caſe muſt be left to nature, in a confirmed abſceſs; unleſs it can be come at through the vagina, and opened with a lancet, and then deterſive injections may perform a cure.

Of the Ulcer *of the* Uterus.

An ulcer may have its iſſue and ſeat in the concave ſurface of the uterus; or may be lodged more deep, and have iſſues into the rectum, bladder, groin, or cavity of the abdomen.

The cauſes of an eroſion may be the fluor albus, or rather lymphaticus; the corruption of the fœtus, or placenta, in the womb; acrid or cauſtic injections; the frequent uſe of cantharides, the lues venerea, or acrimonious menſes.

If the ulcer proceeds from an abſceſs, it may be inflammatory, tuberculous, or ſteatomatous; if from an eroſion, it may be venereal, ſcorbutic, ſcrophulous, or ſimple: It may be alſo ſimple, ſcirrhous, or cancerous.

The chief ſign of an ulcer is the efflux of purulent matter; and the greater the quantity, the profounder the ulcer. If the flux is ſanious, or mixed with blood, the blood-veſſels are eroded. Mortal hæmorrhages ſometimes ſupervene. Sometimes they may proceed from a fever, and rarefaction of the blood.

An ulcer is hard to be diſtinguiſhed from a fluor albus: however pus is always more compact and fetid, unleſs it is lymphatic; and there is always a fixed pain from an ulcer.

All ulcers of the uterus are dangerous; when they are fiſtulous, or ſcirrhous, or both, they portend death: the ſame may be ſaid of the cancerous; or when they are attended with a ſlow hectic fever, ſwellings of the feet, a maraſmus, *&c.*

In order to the cure, it is neceſſary to know whether the ulcer is ſeated in the body of the uterus, or near the os uteri, in the vagina; or whether it be venereal, for the laſt muſt be treated as that diſtemper requires.

To correct the vicious acrimony of the blood, uſe broths, or decoctions of lettuce, ſuccory, borrage, with ſal prunella; ſometimes with veal or a pullet; alſo chalybeated whey, ſweetened with ſyrup of violets. But the beſt thing is a milk-diet; to which, for variety-ſake, may be added rice, eggs, a decoction of china, barley, *&c.* or chervil, agrimony, fumitory, or the ſecond lime-water, or ſteel-waters alone. Likewiſe emollient baths or ſemicupia.

Injections of whey and brown ſugar are good.

To conſolidate the ulcer, uſe injections of agrimony, with the ſecond lime water; or warm ſulphureous bath-waters, and the fumigations of the gums.

To eaſe the pain, give gentle narcotics.

Of the Scirrhus *of the* Uterus.

Sometimes an inflammation of the uterus ends in a ſcirrhus, which is a hard, renitent, and indolent tumour, without heat and pain.

It is a very troubleſome diſorder, and often incurable, and the attempt to remove it is dangerous, though it is apt to bring on dropſies, a cancer, a maraſmus, *&c.* Its ſeat is in the glands, lymphatic veſſels, or lacteals of the uterus.

The ſymptoms are, a weight in the hypogaſtrium, when the patient ſtands or walks; difficulty of lying on the well ſide; if the tumour is painful, ſhe is obliged to lie on her back; the menſes are ſuppreſſed; ſometimes there are violent and dangerous hæmorrhages; a dropſy of the abdomen or uterus: If it ſuppurates, there are ſigns of an abſceſs. It may be partly diſcovered by preſſing the hand on the region of the os pubis.

If the tumour be ſmall, recent, and void of pain, you may give broths of eringo, reſt-harrow, and aſparagus roots, of each half an ounce. Whey, with vitriolate tartar, or chalybeated whey, are very gentle. Or give a pint every day of vitriolic waters, for two or three months.

If theſe heat too much, ſhe muſt drink aſſes or goats milk. This is a palliative cure. But, to diſſolve the ſcirrhous matter, the patient muſt uſe baths, and half baths, of emollient decoctions. Emollient injections and moderate clyſters are very beneficial.

When heat, pain, and tenſion of the uterus are perceived, forbear deobſtruents, and bleed. Uſe no aperitives at the time of purging. At other times uſe diluents and narcotics. If the tumour does not diminiſh, leave theſe medicines off, and have recourſe to the palliative cure.

Of the Cancer *of the* Uterus.

A Cancer is a ſcirrhus become exquiſitely painful. When there is a darting or lancinating pain in the ſcirrhus, and in fifteen days or a month it becomes much larger than it was before, and ſcabrous, that is, angular and rugged; and the ſkin that covers it is ſmoother, till a fiſſure appears; the lips of which are retorted, and an ichor or acrimonious ſeroſity proceeds therefrom, with

with a soft fungous flesh about the fissure; you have the progress to a confirmed cancer. The matter never becomes pus.

An ulcer of the uterus resembles a cancer, when a putrid sanies issues from the corrupted substance of the womb, with great stench, exquisite pain, and grievous symptoms. This disease is almost incurable.

The principal symptom of a cancer is pain, which is attended with restlessness, watching, indigestion: which produce a slow fever, consumption, marasmus, and the like.

A hard, renitent, painful tumour, preceded by an indolent scirrhus, plainly evinces the existence of a cancer. If nothing is discharged by the uterus, but a limpid, pellucid lymph, it is an occult cancer; if acrid serum, or ichor, it is open.

There is nothing to be done in this case, but by demulcents and lenients. If there is any hope of cure, it must be placed in asses milk, the Selters waters, and in bathing in soft water wherein wheat-bran has been boiled; in which the patient must sit for an hour, or longer. She must abstain from all sharp, acrid, stimulating, and heating things.

Of the Procidentia Uteri.

It is a common disorder; and the uterus presents itself in the vagina between the labia, or is quite visible. Sometimes it is only the internal membrane of the vagina, sometimes the body of the womb.

This disorder is rarely dangerous, for women bear it a long time.

The cure consists in reducing the uterus, and retaining it in its place. To reduce it, order a simple clyster to evacuate the rectum; the patient should also bleed three or four times: Then emollient cataplasms should be used of white bread and milk, or of emollient plants; emollient baths are also to be employed. The parts being thus relaxed, the patient must lie on her back, with her hips higher than her head, and her legs quite asunder; then put back the uterus by degrees, where you find the least resistance, and without any violence. This done, the patient must be confined to her bed for about fifteen days, with her thighs closed, or her legs across, and her hips raised.

The cure must be compleated with astringent injections, baths, and pessaries; with fumigations of frankincense, red roses, and mastich.

For Abortions, } see Midwifery.
For Child-birth, }

Of CHILDRENS DISEASES.

Of Disorders *from a* Retention *of the* Meconium.

Infants newly born, from a retention of the meconium and other sordid matter in the *primæ viæ*, are subject to gripings or pains in the belly, which produce constant crying, hiccups, the jaundice, wakefulness, restlessness, startings, frights, convulsions, and epilepsies; which, unless timely prevented, are fatal.

To carry this off, infants should suck the first milk of their mother, if they give suck; otherwise they should fast ten or twelve hours; or take the following mixture, which will soften it:

Take 6 drams of fresh milk whey, and one dram of honey; make them into a draught.

Heister advises a grain or two of the powder of jalap, or two or three of rhubarb in syrup of roses solutive, or a solution of manna; some give half an ounce of oil of sweet almonds, with a little barley-sugar. A grain of aurum fulminans is the surest remedy.

Of Disorders *from* Costiveness *and* Wind.

If after some time the excrements become hard, with costiveness and a retention of wind, they will cause the symptoms abovementioned. In this the same remedies may be used, till the child's belly is open, and the acid or corrupted milk should be corrected with absorbent and testaceous powders; whereof half a scruple is a dose. Harris believes an acid to be so predominant in infants, as to cause all their diseases. Boerhaave affirms, if absorbents are useful at any time, they must be in these cases, and orders vij grains of the testaceous powders three times a day.

The nurse must forbear to feed upon any thing that is sour or acid.

Of Watching, *or* Want *of* Sleep.

Want of sleep proceeds from the gripes, or costiveness, and wind and pain occasion edthereby: we judge of the health of children by their sleeping quietly, and of their illness by their watching, crying, and screaming. Watching may proceed from the milk being corrupted in the stomach, or from costiveness, or from wind.

In this disorder the body should be always kept open, first by a clyster, and then a purge; and the absorbents are to be given, and carminatives, particularly powder of aniseed; and the belly is to be anointed with carminative oil. Soon after the purge, give two drams of oil of almonds. The nurses should avoid acid and flatulent things, and catching cold. Opiates, diascordium, and theriaca, must never be used, unless in cases of extreme necessity.

Of the Aphthæ, *or* Thrush.

The aphthæ are little whitish ulcers affecting the whole superficies of the mouth, that is, the lips, gums, checks, tongue, palate, and fauces; nay, they even descend through the œsophagus to the stomach and intestines, and to the anus; but then they are very dangerous, and commonly put a period to the infant's life.

Boerhaave says, if the aphthæ are of a pearl-colour, pellucid, white, few in number, superficial, soft, and fall off easily, apt to return in part, they are of the best sort; but if they are white or opake, like bacon, yellow, brown, black, thick, dense, running together, hard, tenacious, constantly restored, corrosive, they are bad.

Harris believes gargles to be of little service, because infants cannot use them, inasmuch as they swallow every thing that is put into their mouths. He therefore relies for a cure on the testaceous powders, and the most gentle cathartics, and believes them sufficient,

Allen says the decoction of elm-bark is the best gargarism for the cure of the aphthæ.

This

This diſeaſe often attacks ADULTS in acute diſeaſes and inflammation of the viſcera. Boerhaave obſerves they are moſt common among the northern people, that inhabit low marſhy places, and often attend a continual putrid fever, or an intermittent becoming continual; and that they are uſhered in with a diarrhœa, or a dyſentery, a nauſea, vomiting, loſe of appetite, great anxiety about the præcordia often returning, ſome great evacuation of the fluids, a ſtupor and dulneſs, ſleepineſs, a perpetual complaint of weight about the ſtomach.

To cure this diſtemper, hot, diluting, reſolvent, and detergent medicines muſt be given, that the cruſt may be diſpoſed to fall off eaſily.

Huxham adviſes, when the aphthæ ſupervene in fevers, to uſe gargles frequently of emollients and detergents, made with figs, hydromel, decoction of turnips, *&c.* To give rhubarb inwardly, chiefly if the patient is griped and looſe, adding an aromatic aſtringent with abſorbents.

Of GALLING *and* EXCORIATION.

THERE is often an excoriation of the parts near the pudenda, chiefly of the groin and ſcrotum; in the wrinkles of the neck, under the arms, and in other places, proceeding from the acrimony of the urine and ſweat. From this proceed itching pains, crying, watching, and reſtleſſneſs.

To remedy this, the parts affected may be waſhed often with warm water, and ſprinkled with drying powders, ſuch as chalk, burnt hartſhorn; but eſpecially tutty, and ceruſs, which may be tied cloſely in a rag, and the powders ſhook out on the diſordered places,

If the parts affected are more ſore, and tend to a real ulceration, it will be proper to add a little ſaccharum ſaturne to the powders. Likewiſe a little white vitriol diſſolved in ſpring water, and daubed upon the part, will dry and heal it very powerfully.

Of the STOPPAGE *of the* NOSE.

THE noſtrils of infants are often plugged up with a groſs mucus, inſomuch that they can ſcarce breathe, or ſuck, or ſwallow; which renders them very unquiet and uneaſy. To cure it, after a ſuitable purge, diſſolve two or three grains of white vitriol in half an ounce of marjoram water; then filtre it, and apply it now and then to the noſtrils with a linen rag.

Or you may apply oil of ſweet almonds, impregnated with the oil of marjoram, to the bottom and ſides of the noſtrils, which will reſolve the filth, and render the reſpiration free.

Of the SCABBY ERUPTIONS *and* CRUSTA LACTEA

THE heads of children are often troubled with achores or ſcabby eruptions; and if the face is affected with them, they are called cruſta lactea. Theſe are expelled by the benefit of nature; and, before the eruption, the infant is often troubled with epileptic fits from the irritation of the morbific matter.

If the humours ſtrike in, either ſpontaneouſly or by improper applications, or if the exanthemata are of a blackiſh colour, they are very dangerous, and the infant generally falls into an aſthma or a fatal epilepſy.

In the cure, externals, and eſpecially ſuch as are repellent, ſhould be avoided; and things ſhould be given inwardly which correct and temperate the blood, and expel the noxious matter by a diaphoreſis. After the *primæ viæ* are purged, both the nurſe and child ſhould take alexipharmics in the morning, and the teſtaceous powders with calx of antimony, amber, and cinnabar, in the afternoon.

Externally, nothing of ſulphur or mercury ſhould be applied, or repellent lotions, or any thing cold. To mollify the ſcabs, freſh butter, or calves marrow, or cream, are ſufficient. This caſe often proves obſtinate; and then the nurſe ſhould obſerve a ſtrict regimen, uſe good diet, take ſweeteners of the blood, and purgatives now and then.

Of a DIARRHOEA *and* VOMITING.

THE diarrhœa of infants is not to be ſtopped, either with aſtringents or narcotics: For aſtringents turn the flux of ſharp humours towards the noble parts, and endanger the life of the child; and, though narcotics appeaſe the ferocity of the turgeſcent humour for a time, yet they afterwards break out with greater force. Beſides, opiates are too powerful for the tender conſtitution of infants, and muſt not be given at all, or with the utmoſt caution. In ſlight caſes, diaſcordium may be ventured upon, to five or ſix grains; but, if there is a fever, it cannot be given without danger.

Therefore the beſt way is to give chalk, coral, pearls, and the like, of which about half a ſcruple is a doſe; which will abate the orgaſm of the humours, without kindling any new heat: after which the cure may be compleated with rhubarb, from ſix grains to half a ſcruple, in ſolutive ſyrup of roſes.

With regard to VOMITING, if there is great plenty of ſerous and noxious humours in the ſtomach, inſomuch that the ſtomach can retain nothing, if the child is a year or two old, he may ſafely take ſome grains of ipecacuanha; Harris ſays XV: but ſurely a third part of that quantity, nay, one or two grains, may be ſufficient; for this does not require the ſwallowing ſo much liquor after it as ſome others; and yet clears the ſtomach of crudities, viſcidities, and other bad humours.

Of Difficult BREEDING *the* TEETH.

AMONG all the diſorders which afflict children, there are none that generate ſuch grievous ſymptoms as difficult dentition. About five or ſix months after birth, the teeth generally begin to make their appearance; firſt the inciſores, or fore-teeth; next the canini, or dog-teeth; and laſtly, the molares, or grinders. About the ſeventh year there comes a new ſet; and at twenty-one the two inner grinders, called dentes ſapientiæ.

At the time of cutting their teeth, they ſlaver very much, and have a diarrhœa, which is no bad ſign; but when it is difficult, eſpecially when the canine teeth begin to be in motion, and to make their out-way out through the gums, the child has ſtartings in his ſleep, tumours of the gums, gripes, inquietude, watchings, a looſeneſs or coſtiveneſs, greeniſh ſtools, the thruſh, fevers, difficult breathing, ſuffocating catarrhs, convulſions, epilepſies, which often end in death.

It

It ſhews dentition is like to be bad, if the child is perpetually crying, thruſts his fingers into his mouth, and bites the nurſe's nipples; if unequal tubercles are perceived in the gums, both by the ſight and touch, where the teeth are expected to appear; if there is heat in the mouth and the whole body; if they ſtart without a cauſe, eſpecially in ſleep. Theſe do not come on without great ſlavering, and ſometimes a diarrhœa, as was mentioned above.

Harris obſerves, that, when an inflammation appears, the phyſician will labour in vain, if the cure is not begun with applying a leech under each ear. When the ſwelling of the gums ſhews it is time to cut it, to make way for the tooth, he would have it done with a penknife, not with a fine lancet, leſt the wound ſhould heal, and form a cicatrix The food he directs to be no more than luke-warm.

Heiſter internally adviſes aqueous mixtures, temperating powders; externally, oil of ſweet almonds, with ſyrup of violets, or ſyrup of wild poppies, lightly acidulated with ſpirit of vitriol, wherewith often to rub the gums; as alſo with the coral or other ſmooth things, which will have the ſame effect.

Morgan affirms in this caſe, it will be beſt to abate the effervеſcence of the blood with diluters; to appeaſe the pain with gentle opiates; to open the body with purges and clyſters; to draw off the fermented ſerum by bliſters; to promote the cutting of the teeth by cooling, relaxing, and opening the gums; for this purpoſe diacodium is good; or a ſtrong decoction of marſh-mallows and poppy-heads, in thick milk, cream, or neats-foot oil: Theſe take off the heat, and aſſwage the pain.

Of the RICKETS.

CHILDREN are ſeldom attacked with rickets before they are nine months, and after they are two years old; but it frequently happens in the intermediate ſpace between theſe two periods. It may proceed originally from the diſorders of the parents, and may be increaſed by thoſe of the nurſe.

It is likewiſe promoted by feeding the child with aqueous and mucous ſubſtances, crude ſummer-fruits, fiſh; by unleavened farinaceous aliment, and too great a quantity of ſweet things; by an intermittent autumnal ague, or other chronic or acute diſorders; by a ſtriking in of the itch or herpes; by the ſuppreſſion or injudicious cure of ulcers; by being enervated with baths, fomentations, ointments, or moiſt vapours; by continual reſt in a perforated chair, with his coats up.

This diſorder is known, in thoſe who cannot walk, from the cauſes preceding; from his brothers or ſiſters having the ſame diſeaſe; from a flaccid tumour of the head and face; from a flabby looſe ſkin; from a ſwelling of the abdomen; from a falling away of the reſt of the parts, eſpecially of the muſcles; from protuberances of the epiphyſes of the joints, ſuch as the wriſts, ancles, knees, elbows, &c.; from the magnitude of the jugular veins and arteries, while the reſt decreaſe. The legs grow crooked.

In thoſe that have begun to walk, beſides the former ſigns, there is a ſlowneſs, debility, and tottering in his motion; which ſoon proceeds to a conſtant deſire of ſitting, and afterwards changes to lying down; inſomuch that nothing at laſt is moveable, but the neck and head. Add to theſe, an early wit, an underſtanding which exceeds his age, while the appetite and digeſtion continue unhurt.

As he grows older, his head is enlarged, with ample ſutures; his thorax is compreſſed on the ſides; and his ſternum riſes up ſharp, while the extremities of the ribs are knotty. The abdomen is protuberant, and the teeth black and carious. Theſe diſorders ſenſibly increaſing, are the cauſe ever after of pernicious diſeaſes of the ſame kind; principally a ſpina ventoſa, and a caries of the bones.

In the mean while a ſlow feveriſh diſorder preys upon the whole body, till the time of death; and then all the fibres, veſſels, and viſcera appear to be ſoft, flaccid, and the fluids diſſolved and mucous.

The cure is to be attempted with light, nouriſhing, dry aliment, not fat, but ſeaſoned, and taken often: With a little ſound drink, ſuch as beer, not ſtale, but well boiled and fine: With a dry warm air, and dry warm woolen cloathing: With being carried about in the arms, and often ſhook, ſwung, and put in motion: With being drawn in a vehicle over the ſtones: With repeated frictions with warm dry flannel, ſprinkled with aromatics; eſpecially the abdomen and ſpine of the back: With prudently repeated bliſters, with ſtrengthening purges, for ſeveral days ſucceſſively: As alſo by the continued uſe of ſtrengthening, drying, antiſcorbutic remedies, and ſuch as raiſe the ſpirits.

Particularly for food, the bread ſhould be biſcuit, with a little ſaffron and ſpices. The fleſh ſhould be pigeons, pullets, veal, rabbets, mutton, gently roaſted, minced, and mixed with biſcuit, ſalt, a little parſley, thyme, nutmeg, or the like.

Likewiſe rice, millet, pearl barley, boiled with raiſins; to which add a little wine and ſpice. The drink may be generous French red wine, of which give an ounce three or four times a-day.

MEDICINES, whatever ſubſtances ſerve to reſtore health.

Medicines are either ſimple or compound: the former being formed by nature alone; and the latter owing to the induſtry of men, by variouſly mixing the ſimple ones together.

Medicines are likewiſe diſtinguiſhed, from the manner of uſing them into internal or external; and with regard to their effects, they are ſaid to be aſtringent, cathartic, emetic, &c.

M E D

Pocket-MEDICINES, in ſurgery, thoſe which a ſurgeon ought to carry always about him, in a box or convenient caſe.

Thoſe, according to Heiſter, are the common digeſtive ointment, and the brown or Egyptian ointment, for cleanſing and digeſting foul ulcers, and ſome vulnerary balſams, as the linimentum arcæi, or the balſam of Peru, of Gilead or Capivi, or the Samaritan balſam: to theſe muſt alſo be added a plaſter or two, as the diachylon,

diachylon, or ſtypticum Crollii, ſince one or other of theſe is almoſt conſtantly wanted. Neither ſhould there be wanting a piece of blue vitriol for the taking down luxuriant fleſh, and to ſtop hæmorrhages; but if vitriol is wanting, burnt alum, red precipitate, the infernal ſtone, or any other corroſive medicine, will ſupply its place in corroſive intentions, and the laſt will alſo ſerve to open abſceſſes, to make iſſues, and perform many other operations of that kind.

With theſe there ſhould always be kept in readineſs alſo a quantity of ſcraped lint, that the ſurgeon may be able to give immediate aſſiſtance to wounded perſons; ſince, if he is unprepared for this, they may eaſily be taken off by an hæmorrhage; a circumſtance which ought alſo to prevail with him to be always provided with ſuitable bandages.

MEDINA, a city of Arabia Deſerta, ſituated two hundred miles north-weſt of Mecca: in E. long. 40° 35′. N. lat. 24° 30′.

This is called the city of the prophet, on account of Mahomet's being received and protected by the inhabitant's on his flight hither from Mecca, where the Mahometan æra commences.

MEDITERRANEAN SEA, extends from the ſtraits of Gibraltar to the coaſts of Syria and Paleſtine, being upwards of 2000 miles in length, but of a very unequal breadth: the weſt-part of it ſeparates Europe from Africa; and the Levant or eaſt-part of it divides Aſia from Africa.

MEDITULLIUM, is uſed by anatomiſts for that ſpungy ſubſtance between the two plates of the cranium, and in the interſtices of all laminated bones.

MEDIUM, in logic, the mean or middle term of a ſyllogiſm, being an argument, reaſon, or conſideration for which we affirm or deny any thing: or, it is the cauſe why the greater extreme is affirmed or denied of the leſs in the concluſion.

MEDIUM, in arithmetic, or *arithmetical* MEDIUM, or MEAN, that which is equally diſtant from each extreme, or which exceeds the leſſer extreme as much as it is exceeded by the greater, in reſpect of quantity not of proportion: thus 9 is a medium between 6 and 12.

MEDIUM, in philoſophy, that ſpace or region through which a body in motion paſſes to any point: thus air, is the medium wherein bodies move near our earth; water, the medium wherein fiſhes live and move; and glaſs is alſo a medium of light, as it affords it a free paſſage. That denſity or conſiſtence in the parts of the medium, whereby the motion of bodies in it is retarded, is called the reſiſtance of the medium; which together with the force of gravity, is the cauſe of the ceſſation of the motion of projectiles.

Subtile or *ætherial* MEDIUM. See ÆTHER.

MEDLAR, in botany. See MESPILUS.

MEDULLA, in anatomy. See ANATOMY, p. 147.

MEDULLA OBLONGATA. See ANATOMY, p. 287.

MEDULLA SPINALIS. See ANATOMY, p. 288.

MEDUSA, in zoology, a genus of inſects belonging to the order of moluſca. The body is gelatinous, roundiſh, and depreſſed; and the mouth is in the centre of the under part of the body. There are twelve ſpecies, all natives of the ſea.

MEDWAY, a river which riſes in Aſhdon foreſt in Suſſex; and running through Kent, is divided into two branches by the Iſle of Sheppy, one of which is called Eaſt Swale, and the other Weſt Swale.

MEISSEN, once the capital of the marquiſate of Miſſen or Miſnia, in Upper Saxony, on the river Elbe, ten miles north of Dreſden.

MELAMPODIUM, in botany, a genus of the ſyngeneſia polygamia neceſſaria claſs. The receptacle is paleaceous and conical; the pappus conſiſts of one valve-ſhaped leaf, and the calix of five leaves. There are two ſpecies, both natives of Britain

MELAMPYRUM, a genus of the didynamia angioſpermia claſs. The calix has four ſegments; the upper lip of the corolla is compreſſed, and bent back at the edge; and the capſule has two oblique cells, containing two gibbous ſeeds. There are five ſpecies, four of them natives of Britain, *viz* the criſtatum, or creſted cow-wheat; the arvenſe, or purple cow-wheat; the pratenſe, or meadow cow-wheat; and the ſylvaticum, or yellow cow-wheat.

MELANCHOLY, in medicine, a kind of delirium, attended with gloomy thoughts, heavineſs, and ſorrow. See MEDICINE.

MELANTERIA, in natural hiſtory, a very beautiful foſſil of a denſe, compact, and regular texture, and of an extremely bright pale yellow, reſembling nothing ſo much as the pureſt gold: it is remarkably heavy, and is uſually found in little irregular maſſes of the bigneſs of a pigeon's egg, which are broken with a ſlight blow: but it is uſually met with in the form of a fine gold-coloured efflorence or vitriolic and pyritical bodies; or in looſe, ſhattery, and friable maſſes of a more duſky yellow; in which latter ſtate it ſo much reſembles a native ſulphur, that it is frequently miſtaken for one: however, it is not inflammable; but calcines in the fire to a greyiſh powder, which by burning longer changes to a deep and fine purple.

The Greeks uſed it externally, as a gentle eſcharotic and a ſtyptic: they made it an ingredient in their ointments for old ulcers, and uſed to ſprinkle the powder of it on freſh wounds to ſtop the hæmorrhage.

MELANTHIUM, in botany, a genus of the hexandria trigynia claſs. The corolla conſiſts of ſix petals; and the filaments are compoſed of the long ungues of the corolla There are three ſpecies, none of them natives of Britain.

MELANURUS, in ichthyology, See SPARUS.

MELASTOMA, in botany, a genus of the decandria monogynia claſs. The calix is bell-ſhaped, and has four ſegments; the petals are five, inſerted into the calix; and the berry has five cells. There are twelve ſpecies, none of them natives of Britain.

MELCHITES, in church-hiſtory, the name given to the Syriac, Egyptian, and other Chriſtians of the Levant. The Melchites, excepting ſome few points of little or no importance, which relate only to ceremonies and eccleſiaſtical diſcipline, are in every reſpect

profeſſed

professed Greeks; but they are governed by a particular patriarch, who resides at Damas, and assumes the title of patriarch of Antioch.

MELCHISEDECHIANS, in church-history, a sect which arose about the beginning of the third century, and affirmed, that Melchisedek was not a man, but a heavenly power, superior to Jesus Christ: for Melchisedek, they said, was the intercessor and mediator of the angels; but Jesus Christ was so only for men, and his priesthood only a copy of that of Mechisedek.

MELCOMB REGIS, a borough-town of Dorsetshire, six miles south of Dorchester. It sends two members to parliament.

MELEAGRIS, the TURKEY, in ornithology. The head is covered with spongy caruncles; and there is likewise a membranaceous longitudinal caruncle on the throat. There are three species, *viz.* 1. The gallopavo, or North-American turkey of Ray, has a caruncle both on the head and throat; and the breast of the male is bearded. He lives upon grain and insects. When the cock struts, he blows up his breast, spreads and erects his feathers, relaxes the caruncle on the forehead, and the naked parts of the face and neck become intensely red. 2. The cristata, or Brasilican pheasant of Ray, has an erect crest of feathers on the head, and violet-coloured temples: it has a caruncle on the throat, but none on the head. 5. The satyra, or horned pheasant of Edwards, has two blue horns behind the eyes, a red body spotted with black and white. It is a native of Bengal.

MELES, in zoology. See URSUS.

MELIA, the BEAD TREE, in botany, a genus of the decandria monogynia class. The calix consists of 5 teeth, and the corolla of 5 petals; the nectarium is cylindrical, about the length of the corolla, and has ten teeth on the margin; and the drupa, which is shaped like an egg, has five cells. There are two species, none of them natives of Britain.

MELIANTHUS, in botany, a genus of the didynamia angiospermia class. The calix consists of five leaves; and the corolla of four petals, with a nectarium within the lowest one; and the capsule has four cells. There are two species, both natives of Æthiopia.

MELICA, in botany, a genus of the triandria digynia class. The calix consists of two valves, containing two flowers. There are three species, only one of which, *viz.* the nutans, or melic-grass, is a native of Britain.

MELICERES, in surgery, a kind of encysted tumours, so called when their contents are of the consistence of honey.

MELILOT. See TRIFOLIUM.

MELINDA, the capital of the province of the same name, and of all the Portuguese settlements on the coast of Malabar, in Africa: E. long. 39°, S. lat. 3°.

MELINUM, in natural history, the name of an earth, famous in the earliest ages of painting, being the only white of the great painters of antiquity; and, according to Pliny's account, one of the three colours with which alone they performed all their works. It is a fine, white, marly earth, of a very compact texture, yet remarkably light; a sort of texture which must render any earth fit for the painter's use, that is of a proper colour. It is frequently found forming a stratum in the earth, lying immediately under the vegetable mould. It is of a very smooth, but not glossy surface, is very soft to the touch, adheres firmly to the tonge, is easily broken between the fingers, and stains the skin in handling. It melts readily in the mouth, and is perfectly fine, leaving not the least grittiness between the teeth. Thrown into water, it makes a great bubbling and loud hissing noise, and moulders away into a fine powder. It does not ferment with acids, and suffers no change in the fire. These are the characters by which the melinum of the ancients is distinguished from all the other white earths. It is still found in the same place from whence the painters of old had it; which is that from whence it has its name, the island of Milo, called Milos by the Greeks, and is common in most of the adjacent islands. It has been of late tried here as a paint, and is found not to make so bright a white as the other substances now in use among the painters; but seems not liable, like them, to turn yellow; and if so, would be worth the consideration of persons in the colour-trade, especially as it may be had in any quantities for carriage.

MELISSA, in botany, a genus of the didynamia gymnospermia class. The calix is dry, and plain above; the upper lip of the corolla is vaulted and bifid: and the middle lobe of the under lip is cordated. There are eight species, two of which are natives of Britain, *viz.* the calamintha, or common calaminth; and the repeta, or field calaminth.

MELITENSIS TERRA, *earth of Malta,* an earth of which there are two very different kinds; the one of the genus of the boles, the other of the marles. The latter is that known by medicinal authors under this name; the former is the Malta earth now in use: but both being brought from the same place, are confusedly called by the same name. The Maltese marle, which is the terra Melitensis of medicinal authors, is a loose, crumbly, and very light earth, of an unequal and irregular texture, and, when exposed to the weather, soon falls into fine soft powder; but when preserved and dried, it becomes a loose, light mass, of a dirty white colour, with a greyish cast: it is rough to the touch, adheres firmly to the tongue, is very easily crumbled to powder between the fingers, and stains the hands. Thrown into water, it swells, and afterwards moulders away into a fine powder. It ferments very violently with acid menstruums.

Both kinds are found in great abundance in the island of Malta, and the latter has been much esteemed as a remedy against the bites of venomous animals, but with how much justice we cannot say. The other has supplied its place in the German shops, and is used there as a cordial, a sudorific, and astringent. See BOLE.

MELITIS, in botany, a genus of the didynamia gymnospermia class. The calix is larger than the tube of the corolla; the upper lip of the corolla is plain; the under lip is crenated; and the antheræ are in the form of a cross. There is but one species, *viz.* the melissophyllum, or bastard baum.

MELLER, a large lake of Sweden, on the north side of which stands the capital city of Stockholm: it is eighty miles long, and thirty broad.

MELOCHIA, a genus of the monadelphia pentandria class,

clafs. It has five ftyli; and the capfule has five cells, each containing one feed. There are fix fpecies, none of them natives of Britain.

MELODY, in mufick, the agreeable effect of different founds, ranged and difpofed in fucceffion; fo that melody is the effect of a fingle voice or inftrument, by which it is diftinguifhed from harmony.

MELOE, in zoology, agenus of infects of the order of coleoptera. The antennæ are jointed, the laft joint being oval; the breaft is roundifh; the elytra are foft and flexible; and the head is inflected and gibbous. There are 16 fpecies, principally diftinguifhed by their colour. The veficatorius, or cantharis of the fhops, when bruifed, is univerfally ufed as a bliftering plafter.

MELON, in botany. See CUCUMIS.

MELOTHRIA, in botany, a genus of the triandria monogynia clafs. The calix confifts of five fegments; the corolla is monopetalous and bell-fhaped; and the berry has one cell, containing many feeds.

In Canada, Virginia, and Jamaica, where this fruit commonly grows, it is pickled for the table.

MELTING CONE, in affaying. See CHEMISTRY, p. 113.

MEMBER, in architecture, denotes any part of a building; as, a frieze, cornich, or the like. This word is alfo fometimes ufed for the moulding.

MEMBER *of parliament*. See PARLIAMENT.

MEMBERED, in heraldry, is where the legs or feet of an eagle, griffin, or other bird, are of a different colour from the reft of the body.

MEMBRANE, in anatomy, a pliable texture of fibres interwoven together in the fame plane. See ANAT. part I and II.

MEMECYLON, in botany, a genus of the octandria monogynia clafs. The calix is above the fruit, and has an entire margin; the corolla confifts of one petal; and the berry is crowned with a cylindrical calix. There is but one fpecies, a native of Ceylon.

MEMOIRS, in matters of literature, a fpecies of hiftory, written by perfons who had fome fhare in the tranfactions they relate; anfwering to what the Romans called Commentarii.

MEMORY, a faculty of the human mind, whereby it retains and recals the ideas it has once perceived. See METAPHYSICS.

MEMPHIS, once the capital of Egypt, ftood on the weft fide of the Nile, almoft oppofite to Grand Cairo

MENDICANTS, or begging friers, feveral orders of religious in Popifh countries, who, having no fettled revenues, are fupported by the charitable contributions they receive from others.

MENGRELIA, a province of Afiatic Turky, fituated on the north-eaft part of the Euxine fea, between Georgia and Circaffia, where the Turks purchafe boys and young women for their feraglios.

MENIALS, domeftic or houfehold fervants, who live under their lord or mafter's roof.

MENINGES, or MENYNGES, in anatomy, a name given to the dura and pia mater of the brain.

MENISCUS, in optics, a lens convex on one fide, and concave on the other. See OPTICS.

MENISPEMUM, in botany, a genus of the diœcia dodecandria clafs. The calix confifts of fix leaves, and the corolla of fix petals. It has three berries, containing each a kidney-fhaped feed. There are feven fpecies, none of them natives of Britain.

MENNONITES, a fect of baptifts in Holland, fo called from Mennon Simonis of Friezland, who lived in the fixteenth century. This fect believe, that the New Teftament is the only rule of faith; that the terms Perfon and Trinity are not to be ufed in fpeaking of the Father, Son, and Holy Ghoft; that the firft man was not created perfect; that it is unlawful to fwear, or to wage war upon any occafion; that infants are not the proper fubjects of baptifm; and that minifters of the gofpel ought to receive no falary.

MENOLOGY, the Greek calendar, in which the lives of the faints in fhort, or barely their names, are cited; anfwering nearly to the martyrology of the Latin church. See MARTYROLOGY

MENSA, in law-books, a term that includes in it all patrimony, and neceffaries for livelihood.

MENSALS, in church-hiftory, fuch livings as were formerly united to the tables of religious houfes, and hence called menfal benefices.

MENSES, FLOURS, COURSES, *Catamenia*, in medicine, the monthly evacuations from the uterus of women not with child and not giving fuck. See MEDICINE.

MENSTRUUM, in chemiftry, any body which in a fluid or fubtilifed ftate is capable of interpofing its fmall parts betwixt the fmall parts of other bodies, fo as to divide them fubtilely, and form a new uniform compound of the two. See CHEMISTRY.

MENSURATION, in general, denotes the act or art of meafuring lines, fuperficies, or folids. See GEOMETRY.

MENTHA, in botany, a genus of the didynamia gymnofpermia clafs. The corolla confifts of four fegments; and the ftamina are erect and diftant. There are 14 fpecies, 11 of them natives of Britain, *viz.* the fpicata, or fpear-mint; the longifolia, or horfe-mint; the rotundifolia, or round leaved horfe-mint; the piperita, or pepper mint; the gentilis, or red-mint; the verticillata, or curled-mint; the arvenfis, or corn-mint; the exigua, or fmooth-mint; the aquatica, or water-mint; the hirfuta, or round-headed mint; and the pulegium, or penny-royal.

MENTZ, the capital of one of the electorates of the fame name in Germany, fituated at the confluence of the rivers Rhine and Maine: E. long. 8°, and N. lat. 50°.

MENYANTHES, in botany, a genus of the pentandria monogynia clafs. The corolla is hairy; the ftigma is bifid; and the capfule has but one cell. There are three fpecies, two of which are natives of Britain, *viz.* the trifolia, or buck-bean; and the nymphoides, or fringed water lilly.

MEOTIS, or PALUS MEOTIS, a fea of Turky, which divides Europe from Afia, extending from Crim Tartary to the mouth of the river Don, or Tanais.

MERCATOR's SAILING, that performed by Mercator's chart. See NAVIGATION.

MER-

Plate CX.

Fig. 1. MANTLE

Fig. 3. MELEAGRIS *or Horned Pheasant*

Fig. 2. MARTLETS

Fig. 4. MERGUS *or* ROUND CRESTED DUCK

A. Bell Sculpt.

MERCHANT, a perſon who buys and ſells commodities in groſs, or deals in exchanges; or that traffics in the way of commerce, either by importation or exportation. See COMMERCE.

MERCURIAL, ſomething conſiſting of or relating to mercury.

MERCURIALIS, in botany, a genus of the dioecia enneandria claſs. The calix of both male and female conſiſts of three ſegments; neither of them have any corolla; the ſtamina are from nine to twelve; the antheræ are globular and didymous; the female has two ſtyli; and the capſule has two cells, and one ſeed in each. There are four ſpecies, two of them natives of Britain, *viz.* the perennis, or dogs mercury; and the annua, or French mercury.

MERCURY, in natural hiſtory. See CHEMISTRY, p. 85. and 137.

MERCURY, ☿, in aſtronomy. See ASTRONOMY, p. 436.

MERCURY, in heraldry, a term uſed, in blazoning by planets, for the purple colour in the arms of ſovereign princes.

MERCY-SEAT, in Jewiſh antiquity. See PROPITIATORY.

MERGUS, in ornithology, a genus of birds, of the order of the anſeres, diſtinguiſhed by having the beak of a cylindrical figure, and hooked at the extremity, and its denticulations of a ſubulated form. There are ſix ſpecies of this genus, *viz.* 1. The cucullatus, or creſted diver of Cateſby, has a globular creſt, white on each ſide; and the body is brown above, and white below. It is a native of America. *See Pl.* 110. 2. The merſanger, has a longitudinal creſt, ſomewhat erect, a white breaſt, and a black head. It is a native of Europe. 3. The ſerrator, has a hanging creſt, a variegated browniſh breaſt, and a white collar. It is a bird of Europe. 4. The caſter has a creſted aſh-coloured head, a white throat, and a black bill and legs. It inhabits the ſouth of Europe. 5. The albellus, has a hanging creſt, a black head and back, and white below. It is a bird of Europe. 6. The minutus, has a ſmooth gray head, with a black ſpot near the eyes. It is a native of Europe.

MERIDIAN. See GEOGRAPHY, and ASTRONOMY.

MERIONETHSHIRE, a county of north Wales, bounded by Caernarvon and Denbighſhire on the north, by Montgomeryſhire on the ſouth eaſt, and by the Iriſh ſea on the weſt.

MERIT, ſignifies deſert. This term is more particularly uſed to ſignify the moral goodneſs of the actions of men, and the rewards to which thoſe actions intitle them.

MERLIN, in ornithology. See FALCO.

MERLON, in fortification, is that part of a parapet which is terminated by two embraſures of a battery.

MERNS, a county of Scotland, bounded by Mar on the north, by the German ocean on the eaſt, by Angus on the ſouth, and by Gowry on the weſt.

MEROPS, in ornithology, a genus belonging to the order of picæ. The bill is crooked, flat, and carinated; the tongue is jagged at the point; and the feet are of the walking kind. There ſix ſpecies, *viz.* 1. The apiaſter, or bee-eater, has an iron-coloured back; the belly and tail are of a bluiſh green; and the throat is yellow. It inhabits the ſouth of Europe. 2. The viridis, or Indian bee-eater, is green, with a black belt on the breaſt; and the throat and tail are black. 3. The congener is yellowiſh, with a green rump. It inhabits the ſouth of Europe. 4. The ſuperciliofus, is green, with a white line both above and below the eyes, and a yellow throat. It is found in Madagaſcar. 5. The cinereus, is variegated with red and yellow, with the two longeſt quill-feathers of the tail red. It is a native of America. 6. The caſer is grey, with a a very long tail. It is a native of Æthiopia.

MERSE, a county of Scotland, bounded by Lothian on the north, by the German ocean on the eaſt, by Northumberland and Tiviotdale on the ſouth, and by Tweeddale on the weſt.

MERULA, in ornithology. See TURDUS.

MESEEN, the capital of a province of the ſame name, in Ruſſia: it is a port-town, ſituated on the coaſt of the White ſea, on hundred and fifty miles north eaſt of Archangel.

MESEMBRYANTHEMUM, in botany, a genus of the icoſandria pentagynia claſs. The calix conſiſts of five ſegments, and the corolla of numerous linear petals; and the capſule is fleſhy below the flower, and contains many ſeeds. There are 45 ſpecies, none of them natives of Britain.

MESENTERY, in anatomy. See ANATOMY, p. 262.

MESNE, in law, ſignifies him who is lord of a manor, and who hath tenants holding of him, yet himſelf holding of a ſuperior lord.

MESOCOLON, in anatomy. See ANATOMY, p. 262.

MESOLOGARITHMS, according to Kepler, are the logarithms of the co-ſines and co-tangents, the former of which were called by lord Napier antilogarithms, and the latter differentials.

MESOPOTAMIA, the ancient name of Diarbeck. See DIARBECK.

MESOPTERYGIUS, in ichthyology, a term applied to ſuch fiſhes as have only one back-fin, and that ſituated in the middle of the back.

MESPILUS, in botany, a genus of the icoſandria pentagynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; the berry is below the flower, and contains five ſeeds. There are ſeven ſpecies, only one of which, *viz.* the germanica, or medlar, is a native of Britain.

MESSASIPPI, or MESCHASIPPI, a country of North America, bounded by Canada on the north, the Britiſh plantations on the eaſt, the gulph of Mexico on the ſouth, and the province of New Mexico on the weſt.

MESSENGERS, are certain officers chiefly employed under the direction of the ſecretaries of ſtate, and always in readineſs to be ſent with all kinds of diſpatches foreign and domeſtic. They alſo, by virtue of the ſecretaries warrants, take up perſons for high treaſon, or other offences againſt the ſtate.

MESSIAH, the ANOINTED; a title which the Jews gave to their expected great deliverer, whoſe coming they ſtill wait for: and a name the Chriſtians apply to Jeſus

ſus Chriſt, in whom the prophecies relating to the Meſſiah were accompliſhed.

MESUA, in botany, a genus of the polyandria monogynia claſs. The calix has four leaves; the corolla four petals; and the capſule has four valves, containing four ſeeds. There is but one ſpecies, a native of India.

METACARPUS, in anatomy. See ANATOMY, p. 181.

METALS, in natural hiſtory, are defined to be foſſile bodies, fuſible by fire, concreting again in the cold, and malleable, or diſtenſible and ductile under the hammer. See CHEMISTRY.

Semi-METALS, metallic foſſils, fuſible by fire, and not malleable in their pureſt ſtate. See CHEMISTRY.

METAL, in heraldry. There are two metals uſed in heraldry, by way of colours, *viz.* gold and ſilver, in blazon called *or* and *argent*.

In the common painting of arms theſe metals are repreſented by white and yellow, which are the natural colours of thoſe metals. In engraving, gold is expreſſed by dotting the coat, *&c.* all over; and ſilver, by leaving it quite blank.

It is a general rule in heraldry, never to place metal upon metal, nor colour upon colour; ſo that if the field be of one of the metals, the bearing muſt be of ſome colour; and if the field be of any colour, the bearing muſt be of one of the metals.

METALLURGY, comprehends the whole art of preparing and working metals, from the glebe, or ore, to the utenſile; in which ſenſe, aſſaying, ſmelting, refining, ſmithery, gilding, *&c.* are only branches of metallurgy.

METAMORPHOSIS, in general, denotes the changing of ſomething into a different form; in which ſenſe it includes the transformation of inſects. See NATURAL HISTORY.

METAPHOR, in rhetoric, a trope, by which we put a ſtrange word for a proper word, by reaſon of its reſemblance to it; or it may be defined, a ſimile or compariſon intended to enforce and illuſtrate the thing we ſpeak of, without the ſigns or forms of compariſon. Thus, if we ſay, *God is* a ſhield *to good men*, it is a metaphor; becauſe the ſign of compariſon is not expreſſed, though the reſemblance which is the foundation of the trope, is plain; for as a ſhield guards him that bears it, againſt the attacks of an enemy, ſo the providence and favour of God protects good men from malice and misfortunes: but if the ſentence be put thus, *God is* as a ſhield *to good men*, then it becomes a ſimile or compariſon.

METAPHYSICS.

METAPHYSICS is that part of philoſophy which conſiders the nature and properties of thinking beings.

Ariſtotle, after treating on phyſics, begins his next book, (in which he pretends to elevate the mind above corporeal objects, to fix it on the contemplation of God, of angels, and of things ſpiritual, and to enable it to judge of the principles of ſciences by abſtraction,) with the Greek words μετα τα φυσικα, *poſt phyſicam*, i. e. *after metaphyſics*. His diſciples, and ſucceeding philoſophers, have formed, of theſe two, one word, METAPHYSICS, by which they mean that ſcience of which we have juſt now given the definition.

Metaphyſics is divided, according to the objects that it conſiders, into ſix principal parts, which are called, 1. Ontology: 2. Coſmology: 3 Antrophology: 4. Pſychology: 5. Pneumatology: and, 6. Theodicy, or metaphyſical theology.

1. The doctrine that is named *Ontology*, is that part of metaphyſics which inveſtigates, and explains, the nature and general eſſence of all beings, as well as the qualities and attributes that eſſentially appertain to them, and which we ought to aſſign them by abſtraction, as conſidering them *a priori*. Hence it appears, that this doctrine ſhould proceed in its operations from the moſt ſimple ideas; ſuch as do not admit of any other qualities of which they may be compounded. Theſe ſimple ideas are, for example, thoſe of being, of eſſence, of ſubſtance, of mode, of exiſtence as well with regard to time as place, of a neceſſary cauſe, of unity, the idea of negation, the difference between a being that is ſimple or compound, neceſſary or accidental, finite or infinite; the idea of eſſential and abſtract properties, as of the greatneſs, perfection, and goodneſs of beings; and ſo of the reſt. The buſineſs therefore of ontology, is to make us acquainted with every kind of being in its eſſence and abſtract qualities, and ſuch as are diſtinct from all other beings. This knowledge being once eſtabliſhed on ſimple principles, juſt conſequences may from thence be drawn, and thoſe things proved after which metaphyſics inquires, and which is its buſineſs to prove.

It is eaſy to conceive, that even a clear knowledge of beings, and their eſſential properties, would be ſtill defective and uſeleſs to man, if he did not know how to determine and fix his ideas by proper denominations, and conſequently to communicate his perceptions to thoſe whom he would inſtruct, or againſt whom he is obliged to diſpute, as they would not have the ſame perceptions that he has. It is, by the way, perhaps one of the greateſt advantages that we have over other animals, to be able ſo to determine our ideas by ſigns or denominations, either of writing or ſpeech, as to refer each particular perception to its general idea, and each general perception to its particular idea. To render therefore our ideas intelligible to others, we muſt have determinate words or denominations for each being, and the qualities of each being; and ontology teaches us thoſe terms which are ſo neceſſary to fix our ideas, and to give them the requiſite

requisite perspicuity and precision, that we may not dispute about words when we endeavour to extend the sphere of our knowledge, or when we debate concerning the essence of an object, or endeavour to make it more evident. It is for this reason that ontology was formerly regarded as a barren science, that consisted of technical terms only; as a mere terminology: whereas the best modern philosophers make it a more substantial science, by annexing determinate ideas to those words, and the examination of those objects themselves that these terms imply. But the misfortune is, to speak the truth, that in this ontologic determination there is still much uncertainty and sophistry. For, in the first place, we yet know of no metaphysics where all the definitions are just; and in the second place, the words that are employed in these definitions have always something equivocal in their meaning, and have consequently themselves need of definitions; and in this manner we may recede to infinity, unless we recur to the first impressions that the simple words have made in our minds, and the primitive ideas which they there excite. The words *man, love, coach*, &c. say more, and make a stronger impression, than all the definitions we can give of them; by ontologic explications they are almost always covered with a dark cloud.

2 Metaphysics, after having, in as solid a manner as possible, explained and established the principles above mentioned, continues its inquiries to the second part, that is called *Cosmology*, and examines into the essence of the world, and all that it contains; its eternal laws; of the nature of matter; of motion; of the nature of tangible bodies, of their attributes and essential qualities, and of all that can be known by abstraction, and sometimes also by adding the lights that man acquires concerning them by the experience of his senses. It is also in cosmology that we examine the Leibnitzian system; that is, whether God, in creating the world, must necessarily have created the best world; and if this world be so in effect. And in this manner they pursue the argument from consequence to consequence to its last resort. All philosophers, however, do not go equally deep. Each mind has its dose of penetration. Due care should be likewise taken, that subtility, in this chain of reasoning, carried beyond the general bounds of the human mind, do not prejudice either the perspicuity or the truth of ideas: seeing that error here too nearly approaches the truth; and that every idea which cannot be rendered intelligible, is in effect equal to a false idea.

3. *Anthropology*, or the knowledge of man, forms the third branch of metaphysics. It is subdivided into two parts. The first, which consists in the knowledge of the exterior parts of the human frame, does not belong to this science: anatomy and physiology teach that. The business here is only a metaphysical examination of man, his existence, his essence, his essential qualities and necessary attributes, all considered *a priori:* and this examen leads at the same time to

4. *Psychology*, which is the fourth part of metaphysics, and consists in the knowledge of the soul in general, and of the soul of man in particular; concerning which, the most profound, the most subtle and abstract researches have been made, that the human reason is capable of producing; and concerning the substance of which, in spite of all these efforts, it is yet extremely difficult to assert any thing that is rational, and still less any thing that is positive and well supported.

5. The fifth part of metaphysics is called *Pneumatology*. It is not a very long time since this term has been invented, and that metaphysicians have made of it a distinct doctrine. By this they mean the knowledge of all spirits, angels, *&c.* It is easy to conceive that infinite art is necessary to give an account of what we do not absolutely know any thing, and of which, by the nature of the subject itself, we never can know any thing. But the metaphysician presently offers to show us, " what is the idea of a spirit; the effective existence of a spirit; what are its general qualities and properties; that there are rational spirits, and that these rational spirits have qualities that are founded in the moral qualities of God:" for this is, in so many words, what is taught us by pneumatology or pneumatics.

6. *Metaphysical Theology*, which M. Leibnitz and some others call *Theodicy*, is the sixth and last doctrine of metaphysics. It teaches us the knowledge of the existence of God; to make the most rational suppositions concerning his divine essence, and to form a just idea of his qualities and perfections, and to demonstrate them by abstract reasoning *a priori*. Theodicy differs from natural theology, in as much as this last borrows, in fact, from theodicy, proofs and demonstrations to confirm the existence of a Supreme Being; but after having solidly established that great truth, by extending its consequences, natural theology teaches us what are the relations and connexions that subsist between that Supreme Being and man, and what are the moral duties that result from that connexion. As pneumatology is a science highly insidious and chimerical, so is metaphysical theology susceptible of sound argument and demonstration; to the great comfort of mankind, the whole of whose happiness is founded on the certainty of this science. If the effects and operations of spirits in the universe were as evident as the effects and operations of the Deity, and their necessary existence as capable of being proved *a priori*, pneumatology would be a doctrine of equal certainty with theodicy: but as neither one nor the other can be proved, with regard to spirits in general, whilst God manifests himself in every part of nature, we have only to descend from the most simple and abstract ideas, to those that are the most compound; and from thence to reascend, by a chain of reasonings, from the creature up to the Author of the creature and of all nature: We shall find, that the result of all these operations of the mind will constantly be, The necessity of the existence of a God; and we may at all times determine, though very imperfectly, from the weakness of our discernment, what that Supreme Being must be, by positively determining what he cannot be. Every thing that can concur to furnish new proofs on this subject, or to elucidate and establish those which are already known, is therefore of inestimable value to mankind; and though this were the only object of metaphysics, it would highly merit the attention of those of the most refined and most exalted genius.

After giving this general view of the subject, we shall proceed

proceed to give the ſubſtance of what Mr Locke has delivered upon it.

Of ideas in general, and their original.

By the term *idea*, as defined by Mr Locke, is meant whatever is the object of the underſtanding when a man thinks, or whatever it is which the mind can be employed about in thinking.

In order to trace the manner by which we acquire theſe ideas, let us ſuppoſe the mind to be, as we ſay, *white paper*, void of all characters, without any *ideas*: how comes it to be furniſhed? whence has it all the materials of reaſon and knowledge? From *experience* and *obſervation*. This, when employed about external ſenſible objects, we may call *ſenſation*: by this we have the ideas of *bitter*, *ſweet*, *yellow*, *hard*, &c. which are commonly called *ſenſible qualities*, becauſe conveyed into the mind by the ſenſes. The ſame experience, when employed about the internal operations of the mind, perceived and reflected on by us, we may call *reflection*: hence we have the *ideas* of *perception*, *thinking*, *doubting*, *willing*, *reaſoning*, &c.

Theſe two, viz. *external material things* as the objects of ſenſation, and *the operations of our own minds* as the objects of reflection, are the only *originals* from whence all our *ideas* take their beginnings: the underſtanding ſeems not to have the leaſt glimmering of *ideas*, which it doth not receive from one of theſe two *ſources*. Theſe, when we have taken a full ſurvey of them, and their ſeveral *modes* and compoſitions, we ſhall find to contain our whole ſtock of *ideas*; and that we have nothing in our minds which did not come in one of theſe two ways.

It is evident, that children come by degrees to be furniſhed with *ideas* from the objects they are converſant with: they are ſo ſurrounded with bodies that perpetually and diverſely affect them, that ſome ideas will (whether they will or no) be imprinted on their minds. *Light* and *colours*, *ſounds* and *tangible* qualities, do continually ſolicite their proper ſenſes, and force an entrance into the mind. It is late, commonly, before *children* come to have *ideas* of the operations of their minds; and ſome men have not any very clear or perfect *ideas* of the greateſt part of them all their lives: becauſe, though they paſs there continually, yet, like floating viſions, they make not deep impreſſions enough to leave in the mind clear and laſting *ideas*, till the underſtanding turns inward upon itſelf, and reflects on its own operation, and makes them the objects of its own contemplation.

When a man *firſt perceives*, then he may be ſaid *to have ideas*; having *ideas*, and perception, ſignifying the ſame thing.

Of ſimple ideas.

Of ideas, ſome are *ſimple*, others *complex*. A *ſimple idea* is one uniform appearance or conception in the mind, which is not diſtinguiſhable into different *ideas*. Such are the *ideas* of *ſenſible qualities*, which though they are in the things themſelves ſo united and blended, that there is no ſeparation, no diſtance between them, yet the *ideas* they produce in the mind enter by the ſenſes ſimple and unmixed. Thus, though the hand feels *ſoftneſs* and *warmth* in the ſame piece of *wax*, yet the *ſimple ideas* thus united in the ſame ſubject are as perfectly *diſtinct* as thoſe that come in by different ſenſes.

Theſe *ſimple ideas* are ſuggeſted no other way than from the two ways above mentioned, *viz. ſenſation* and *reflection*.

The mind being once ſtored with the *ſimple ideas*, has the power to repeat, compare, and unite them to an infinite variety; and ſo can make, at pleaſure, new *complex ideas*. But the moſt enlarged underſtanding cannot frame one new *ſimple idea*; nor by any force deſtroy them that are there.

Of ideas of one ſenſe.

Ideas, with reference to the different ways wherein they approach the mind, are of *four ſorts*.

Firſt, There are ſome which come into our minds by *one ſenſe* only.

Secondly, There are others conveyed into the mind by *more ſenſes than one*.

Thirdly, Others that are had from *reflection* only.

Fourthly, There are ſome ſuggeſted to the mind by all the ways of *ſenſation* and *reflection*.

Firſt, ſome enter into the mind only by one ſenſe peculiarly adapted to receive them. Thus colours, ſounds, ſmells, &c. come in only by the eyes, ears, and noſe. And if theſe organs are any of them ſo diſordered as not to perform their functions, they have no other way to bring themſelves in view, and be perceived by the underſtanding.

We ſhall here mention one, which we receive by our touch, becauſe it is one of the chief ingredients in many of our complex ideas; and that is, the idea of *ſolidity*: it ariſes from the reſiſtance one body makes to the entrance of another body into the place it poſſeſſes, till it has left it. There is no idea which we more conſtantly receive from ſenſation than this. In whatever poſture we are, we feel ſomewhat that ſupports us, and hinders us from ſinking downwards: and the bodies we daily handle, make us perceive, that while they remain between them, they do, by an unſurmountable force, hinder the approach of the parts of our hands that preſs them. This ſeems to be the moſt eſſential property of body, and that whereby we conceive it to fill ſpace: the idea of which is, that where we imagine any ſpace taken up by a ſolid ſubſtance, we conceive it ſo to poſſeſs it, that it excludes all other ſolid ſubſtances. This reſiſtance is ſo great, that no force can ſurmount it. All the bodies in the world preſſing a *drop of water* on all ſides, will never be able to overcome the reſiſtance it makes to their approaching one another, till it be removed out of their way.

The idea of *ſolidity* is diſtinguiſhed from that of *pure ſpace*, in as much as this *latter* is neither capable of reſiſtance nor motion: it is diſtinguiſhed from *hardneſs*, in as much as hardneſs is a firm coheſion of the ſolid parts of matter making up maſſes of a ſenſible bulk, ſo that the whole doth not eaſily change its figure. Indeed, *hard* and *ſoft*, as commonly apprehended by us, are but *relative* to the conſtitutions of our bodies: that being called *hard* which will put us to pain ſooner than change its figure by the preſſure of any part of our bodies; and that *ſoft*, which

which changes the ſituation of its parts upon an eaſy and unpainful touch.

This difficulty of changing ſituation among the parts, gives no more ſolidity to the hardeſt body, than to the ſofteſt; nor is an adamant one jot more ſolid than water He that ſhall fill a yielding ſoft body well with air or water, will quickly find its reſiſtance. By this we may diſtinguiſh the idea of the extenſion of body, from the idea of the extenſion of ſpace: That of body, is the coheſion or continuity of ſolid, ſeparable, and moveable parts; that of ſpace, the continuity of unſolid, inſeparable, and immoveable parts. Upon the ſolidity of bodies depends their mutual impulſe, reſiſtance, and protruſion.

Of ſimple ideas of different ſenſes.

Some ideas we get into the mind by *more than one ſenſe*; as *ſpace*, *extenſion*, *figure*, *reſt*, and *motion*. Theſe are perceivable by the eyes and touch.

Of ſimple ideas of reflection.

Some ideas are had from reflection only: Such are the ideas we have of the operations of our minds; of which the two principal are, *perception*, or *thinking*; and *volition*, or *willing* The powers of producing theſe operations are called *faculties*; which are, the *underſtanding*, and *will*. The ſeveral *modes* of thinking, *&c.* belong to this head.

Of ſimple ideas of ſenſation and reflection.

There are ſome ſimple ideas conveyed into the mind by all the ways of *ſenſation* and *reflection*; ſuch are *pleaſure*, *pain*, *power*, *exiſtence*, *unity*, *ſucceſſion*. Pleaſure or delight, pain or uneaſineſs, accompany almoſt every impreſſion on our ſenſes, and every action or thought of the *mind*.

The Author of our beings having given a power to our minds, in ſeveral inſtances, to chuſe amongſt its ideas which it will think on; to excite us to theſe actions of *thinking* and *motion*, he has joined to ſeveral thoughts and ſenſations a perception of delight; without this we ſhould have no reaſon to prefer one thought or action to another.

Pain has the ſame efficacy to ſet us on work that pleaſure has; ſince we are as ready to avoid that, as to purſue this. This is worth our conſideration, that *pain is often produced by the ſame objects and ideas that produce pleaſure* in us. This their near conjunction gives us new occaſion of admiring the wiſdom and goodneſs of our *Maker*; who, deſigning the preſervation of our being, has annexed pain to the application of many things to our bodies, to warn us of the harm they will do us, and as advices to withdraw us from them. But he not deſigning our preſervation barely, but the preſervation of every part and organ in its perfection, hath in many caſes annexed pain to thoſe very ideas which delight us. Thus heat, that is very agreeable to us in one degree, by a little greater increaſe of it proves no ordinary torment: Which is wiſely ordered by *nature*, that when any object does by the vehemence of its operation diſorder the inſtruments of ſenſation, whoſe ſtructures cannot but be very delicate, we might by the pain be warned to withdraw before the organ be quite put out of order, That this is the *end of pain*, appears from this conſideration; that though great light is inſufferable to the eyes, yet the higheſt degree of *darkneſs* does not at all diſeaſe them; becauſe *that* cauſes no diſorderly motion in that curious organ the eye. But exceſs of *cold*, as well as *heat*, pains us; becauſe it is equally deſtructive to the temper which is neceſſary to the preſervation of life.

Exiſtence and *unity* are two other ideas ſuggeſted by every object without, and every idea within. When ideas are in our minds, we conſider them as being actually there, as well as we conſider things to be actually without us; which is, that they *exiſt*, or have exiſtence: And whatever we conſider as *one thing*, whether a *real being*, or *idea*, ſuggeſts the idea of *unity*.

Power is another idea derived from theſe ſources: For finding in ourſelves that we can *think*, and *move* ſeveral parts of our bodies at pleaſure, and obſerving the *effects* that natural bodies produce in one another; by both theſe ways we get the idea of *power*.

Succeſſion is another idea ſuggeſted by our ſenſes, and by reflection on what paſſes in our minds: For if we look into ourſelves, we ſhall find our *ideas* always, whilſt we are awake, or have any thought, paſſing in train, one going and another coming, without intermiſſion.

Some farther conſiderations concerning ſimple ideas.

Whatsoever is able, by affecting our ſenſes, to cauſe any perception in the mind, doth thereby produce in the underſtanding a *ſimple idea*; which, whatſover be the cauſe of it, is looked upon as a *real poſitive idea* in the underſtanding. Thus the ideas of *heat* and *cold*, *light* and *darkneſs*, *motion* and *reſt*, &c. are equally poſitive in the mind, though ſome of their cauſes may be mere *privations*.

That a *privative* cauſe may produce a *poſitive* idea, appears from ſhadows; which (though nothing but the abſence of light) are diſcernible, and cauſe clear and poſitive ideas. We have indeed ſome *negative* names which ſtand not directly for poſitive ideas, but for their abſence; ſuch as *inſipid*, *ſilence*, which denote poſitive ideas, *viz.* *taſte* and *ſound*, with a ſignification of their abſence.

It will be uſeful to diſtinguiſh *ideas* as they are *perceptions* in our minds, from what *they are in the bodies* that cauſe ſuch perceptions in us; for we are not to think the former exact images and reſemblances of ſomething inherent in the ſubject, moſt of thoſe of *ſenſation* being, in the mind, no more the likeneſs of ſomething exiſting without us, than the names that ſtand for them are the likeneſs of our ideas, which yet, upon hearing, they excite in us.

Whatſover the *mind perceives in itſelf*, or is the immediate object of perception, thought, or underſtanding, is an idea: And the power to produce any idea in our mind, is the *quality of the ſubject* wherein that power exiſts. Thus a *ſnow ball* having the power to produce in us the ideas of *white*, *cold*, and *round*; thoſe *powers*, as they are in the ſnow-ball, are called *qualities*; and as they are *ſenſations* or *perceptions* in our underſtandings, they are called *ideas*. Theſe *qualities* are of *two ſorts*: Firſt, *original*, or primary; ſuch are *ſolidity*, *extenſion*,

tenſion, *motion*, or *reſt*, *number*, and *figure*. Theſe are inſeparable from body, and ſuch as it conſtantly keeps in all its changes and alterations.

Secondly, *Secondary qualities*; ſuch as *colours*, *ſmells*, *taſtes*, *ſounds*, &c. which, whatever reality we by miſtake may attribute to them, are in truth nothing in the objects themſelves, but *powers* to produce various ſenſations in us; and depend on the qualities before mentioned.

The *ideas* of *primary* qualities of bodies, are reſemblances of them; and their patterns really exiſt in bodies themſelves: But the ideas produced in us by ſecondary qualities have no reſemblance of them at all; and what is *ſweet*, *blue*, or *warm*, in the idea, is but the certain bulk, figure, and motion of the inſenſible parts in the bodies themſelves, which we call ſo.

Thus we ſee, that fire at one diſtance produces in us the ſenſation of *warmth*, which at a nearer approach cauſes the ſenſation of *pain*. Now what reaſon have we to ſay, that the idea of *warmth* is actually in the fire; but that of *pain* not in the fire; which the ſame fire produces in us the ſame way? The bulk, number, figure, and motion of the parts of fire, are really in it, whether we perceive them or no; and therefore may be called *real* qualities, becauſe they really exiſt in that body: But *light* and *heat* are no more really in it, than ſickneſs or pain: Take away the ſenſation of them; let not the eyes ſee light or colours, nor the ear hear ſounds; let the palate not taſte, or the noſe ſmell; and all *colours*, *taſtes*, *odours*, and *ſounds*, as they are ſuch particular ideas, vaniſh and ceaſe, and are reduced to their cauſes, (that is,) bulk, motion, figure, *&c.* of parts.

Theſe *ſecondary* qualities are of two ſorts. Firſt, *Immediately perceivable*; which by immediately operating on our bodies, produce ſeveral different ideas in us. Secondly, *Mediately perceivable*; which by operating on other bodies, change their primary qualities, ſo as to render them capable of producing ideas in us different from what they did before. Theſe laſt are powers in bodies, which proceed from the particular conſtitution of thoſe primary and original qualities, to make ſuch a change in the *bulk*, *figure*, *texture*, &c. of another body, as to make it operate on our ſenſes different from what it did before; as in fire, to make lead fluid. Theſe two laſt being nothing but powers relating to other bodies, and reſulting from the different modifications of the original qualities, are yet otherwiſe thought of; the former being eſteemed *real qualities*, but the latter barely *powers*.

Of perception.

Perception is the firſt idea we receive from reflection: It is by ſome called *thinking* in general: Though *thinking*, in the propriety of the *Engliſh* tongue, ſignifies that ſort of operation of the mind about its ideas, wherein the mind is active; where it conſiders any thing with ſome degree of voluntary attention: For in bare *perception* the mind is, for the moſt part, only *paſſive*; and what it perceives, it cannot avoid perceiving. What this is, we cannot otherwiſe know, than by reflecting on what paſſes in our minds when we ſee, feel, hear, *&c.*

Impreſſions made on the outward parts, if they are not taken notice of within, cauſe no *perception*; as we ſee in thoſe whoſe minds are intently buſied in the contemplation of certain objects.

We may obſerve that the ideas we receive from ſenſation, are often in grown people altered by the judgment, without our taking notice of it. Thus a globe of any uniform colour, (as of gold, or jet,) being ſet before our eyes, the *idea* thereby imprinted is of a flat circle variouſly ſhadowed: But being accuſtomed to perceive what kind of appearance convex bodies are wont to make in us, the judgment alters the appearances into their cauſes; and, from that variety of ſhadow or colour, frames to itſelf the perception of a convex figure of one uniform colour. This in many caſes, by a ſettled habit, is performed ſo readily, that we take that for the perception of our ſenſation, which is but an idea formed by the judgment; ſo that one ſerves only to excite the other, and is ſcarce taken notice of itſelf: As a man who reads or hears with attention, takes little notice of the characters or ſounds, but of the ideas that are excited in him by them.

Perception is alſo the firſt ſtep and degree towards knowledge, and the inlet of all the materials of it; ſo that the fewer ſenſes any man has, and the duller the impreſſions that are made by them are, the more remote he is from that knowledge which is to be found in other men.

Of retention.

The next faculty of the mind whereby it makes a further progreſs towards knowledge, is called *retention*; which is the keeping of thoſe ideas it has received. Which is done two ways:

Firſt, By keeping the idea which is brought into the mind for ſome time actually in view; which is called *contemplation*.

Secondly, By reviving thoſe ideas in our minds which have diſapeared, and have been, as it were, laid out of ſight: And this is *memory*; which is, as it were, the ſtore-houſe of our ideas; for the narrow mind of man not being capable of having many ideas under view at once, it was neceſſary to have a repoſitory to lay up thoſe ideas, which at another time it may have uſe of. But our ideas being nothing but actual perceptions in the mind, which ceaſe to be any thing when there is no perception of them, this lying up of our *ideas* in the repoſitory of the memory ſignifies no more but this, that the mind has a power, in many caſes, to revive perceptions it has once had, with this additional perception annexed to them, that it has had them them before. And it is by the aſſiſtance of this faculty, that we are ſaid to have all thoſe ideas in our underſtandings which we can bring in ſight, and make the objects of our thoughts, without the help of thoſe ſenſible qualities which firſt imprinted them there.

Thoſe ideas that are often refreſhed by a frequent return of the objects or actions that produce them, fix themſelves beſt in the memory, and remain longeſt there: Such are the *original qualities of bodies*, viz. Solidity, extenſion, figure, motion, *&c.* Theſe and the like are ſeldom quite loſt while the mind retains any *ideas* at all.

Of

Of discerning, and other operations of the mind.

ANOTHER faculty of the mind, is that of *discerning between its ideas*. On this depends the evidence and certainty of several general propositions. In being able nicely to distinguish one thing from another, where there is the least difference, consists, in a great measure, that *exactness of judgment* and *clearness of reason* which is to be observed in one man above another.

To the well distinguishing our *ideas*, it chiefly contributes that they be clear and determinate; and when they are so, it will not breed any coufusion or mistake about them, though the senses should convey them from the same object differently on different occasions.

The comparing of our *ideas* one with another in respect of *extent*, *degree*, *time*, *place*, or any other circumstances, is another operation of the mind about its *ideas* which is the ground of *relations*. Brutes seem not to have this faculty in any great degree. They have probably several *ideas* distinct enough; but cannot compare them farther than some sensible circumstances annexed to the objects themselves.

Composition is another operation of the mind, whereby it combines several of its simple *ideas* into *complex* ones: Under which operation we may reckon that of *enlarging*; wherein we put several *ideas* together of the same kind, as several units to make a *dozen*.

Abstraction is another operation of the mind, whereby the mind forms general *ideas* from such as it received from particular objects; which it does by considering them, as they are in the mind such appearances separate from the circumstances of real existence, as *time*, *place*, &c. These become general *representatives* of all of the same kind, and their names applicable to whatever exists comformable to such abstract *ideas*. Thus the colour received from *chalk*, *snow*, and *milk*, is made a representative of all of that kind; and has a name given it (*whiteness*,) which signifies the same quality, wherever to be found or imagined. And thus *universals*, both *ideas* and *terms*, are made.

Of complex ideas.

IN the reception of simple ideas the mind is only *passive* having no power to frame any one to itself, nor having any idea which does not wholly consist of them. But about these simple ideas its exerts several acts of its own, whereby out of them, as the materials and foundations of the rest, the other are framed: The acts of the mind, wherein it exerts its power over its simple ideas, are chiefly these three: *First*, It combines several simple ideas into one compound one; and thus all *complex ideas* are made. *Secondly*, It brings two ideas, whether *simple* or *complex*, together, and sets them by one another so as to take a view of them at once, without uniting them into one; by which way it gets all its ideas of relations. *Thirdly*, It separates them from all other ideas that accompany them in their real existence: And thus all its *general ideas* are made. As *simple ideas* are observed to exist in several combinations united together, so the mind may consider them as united, not only as they are really united in external objects, but as itself has joined them *Ideas* thus made up of several ones put together, are called *complex*; as *man*, *army*, *beauty*, *gratitude*, &c. By this faculty of repeating and joining together its *ideas*, the mind has great power in varying and multiplying the objects of its thoughts. But it is still confined to those simple *ideas* which it received from the two sources of *sensation* and *reflection*. It can have no other *ideas* of sensible qualities, than what come from without by the senses, nor any other *ideas* of the operations of a thinking substance than what it finds in itself; but having once got these simple *ideas*, it can by its own power put them together, and make new *complex ones*, which it never received so united.

Complex ideas, however compounded and decompounded, though their number be infinite, and their variety endless, may all be reduced under these three heads: 1st, *Modes*; 2dly, *Substances*; 3dly, *Relations*.

1st, *Modes* are such complex *ideas* as contain not the supposition of subsisting by themselves but are considered as dependances on, and affections of substances; as *triangle*, *gratitude*, *murder*, &c. These modes are of two sorts: First, *Simple*; which are combinations of the same simple *idea*; as a *dozen*, *score*, &c. which are but the *ideas* of so many distinct units put together. Secondly, *Mixed*; which are compounded of simple *ideas* of several kinds; as *beauty*, which consists in a certain composition of colour and figure, causing delight in the beholder; *theft*, which is the concealed change of the possession of any thing, without the consent of the proprietor. *These* visibly contain a combination of *ideas* of several kinds.

2dly, *Substances*. The *ideas* of substances are only such combinations of simple *ideas*, as are taken to represent distinct particular things subsisting by themselves, in which the confused *idea* of substance is always the chief. Thus a combination of the *ideas* of a certain figure, with the powers of motion, thought, and reasoning, joined to substance, make the ordinary *idea* of man.

These again are either of *single substances*, as *man*, *stone*; or of *collective*, or several put together, as *army*, *heap*. *Ideas* of several substances thus put together, are as much each of them one single *idea*, as that of a *man* or an *unit*.

3dly, *Relations*; which consist in the consideration and comparing of one *idea* with another. Of these several kinds we shall treat in their order.

Of simple modes: And, first, of the simple modes of space.

CONCERNING *simple modes* we may observe, that the modifications of any *simple ideas* are as perfectly different and distinct ideas in the mind, as those of the greatest distance or contrariety: Thus *two* is as distinct from *three*, as *blueness* from *heat*.

Space is a simple idea which we get both by our sight and touch. When we consider it barely in length between two bodies it is called *distance*: when in length, breadth, and thickness, it may be called *capacity*. When considered between the extremities of matter, which fills the capacity of space with something solid, tangible, and moveable, it is called *extension*. And thus *extension* will be an *idea* belonging to body; but *space* may be conceived without it.

Each

Each different *distance* is a different modification of space; and each *idea* of any different space is a *simple mode* of this *idea*. Such are an *inch*, *foot*, *yard*, &c. When these *ideas* are made familiar to mens thoughts, they can in their minds repeat them as often as they will, without joining to them the *idea* of body, and frame to themselves the *ideas* of feet, yards, or fathoms, beyond the utmost bounds of all bodies; and, by adding these still one to another, enlarge their *idea* of space as much as they please. From this power of repeating any *idea* of distance, without being ever able to come to an end, we come by the *idea* of immensity.

Another modification of *space* is taken from the *relation* of the parts of the termination of extension or circumscribed space amongst themselves; and this is what we call *figure*. This the *touch* discovers in sensible bodies, whose extremities come within our reach; and the *eye* takes both from bodies and colours, whose boundaries are within its view; where observing how the extremities terminate either in straight lines, which meet at discernible angles, or in crooked lines, wherein no angles can be perceived: by considering these as they relate to one another in all parts of the extremities of any body or space, it has that idea we call *figure*: which affords to the mind infinite variety.

Another *mode* belong to this head, is that of *place*. Our idea of *place* is nothing but the relative position of any thing with reference to its distance from some fixed and certain points. Whence we say, that a thing has or has not changed *place*, when its distance either is or is not altered with respect to those bodies which which we have occasion to compare it. That this is so, we may easily gather from hence, that we can have no idea of the place of the *universe*, though we can of all its parts. To say that the world is *somewhere*, means no more than that it does *exist*. The word *place* is sometimes take to signify that *space* which any body takes up; and so the universe may be conceived in a place.

Of duration, and its simple modes.

THERE is another sort of *distance*, the *idea* of which we get from the fleeting and perpetually perishing parts of succession, which we call *duration*. The simple modes of it are any different lengths of it whereof we have distinct *ideas*; as *hours*, *days*, *years*, &c. *time*, and *eternity*.

The *idea* of *succession* is got by reflecting on that train of *ideas* which constantly follow one another in our minds as long as we are awake. The distance between any parts of this *succession*, is what we call *duration*; and the continuation of the existence of ourselves, or any thing else, *commensurate* to the succession of any *ideas* in our minds, is what we call our *own duration*, or *that* of another thing co-existing with our thinking. That this is so, appears from hence, that we have no perception of succession or duration, when that succession of our *ideas* ceases, as in *sleep*: the moment that we sleep, and awake, how distant soever, seems to be joined and connected. And possibly it would be so to a waking man, could he fix upon one *idea* without variation and the succession of others. And we see that they whose thoughts are very intent upon one thing, let slip out of their account a good part of that *duration*, and think that time shorter than it is. But if a man, during his sleep, *dream*, and a variety of *ideas* make themselves perceptible in his mind one after another, he hath then, during such dreaming, a sense of *duration*, and of the length of it.

A man having once got this *idea* of duration, can apply it to things which exist while he does not think: and thus we measure the time of our sleep, as well as that wherein we are awake.

Duration, as marked by certain periods and measures, is what we most properly call *time*; which we measure by the diurnal and annual *revolutions* of the sun, as being constant, regular, and universally observable by all mankind, and supposed equal to one another.

The mind having once got such a measure of *time*, as the annual revolution of the sun, can easily apply it to duration, wherein that measure itself did not exist; and the *idea* of *duration* equal to an *annual revolution of the sun*, is as easily applicable in our thoughts to duration where no sun nor motion was, as the *idea* of a *foot* or *yard* to distances beyond the confines of the world.

By the same means, and from the same original that we come to have the *idea* of time, we have also that *idea* which we call *eternity*: for having got the ideas of certain lengths of duration, we can in our thoughts add them to one another as oft as we please, without ever coming to an end.

And thus it is plain, that from the two fountains of all knowledge before mentioned, *viz*. *sensation* and *reflection*, we get the ideas of duration, and the several measures of it.

Of numbers.

THE complex *ideas* of *number* are formed by adding several *units* together. The *simple modes* of it are each several combinations, as *two*, *three*, &c. These are of all others most distinct, the nearest being as clearly different from each other as the most remote: *two* being as distinct from *one*, as two hundred. But it is hard to form distinct *ideas* of every the least excess in extension. Hence demonstrations in numbers are more general in their use, and more determinate in their application, than those of extension.

Simple modes of numbers being in our minds but so many combinations of units, which have no variety but *more* or *less*; *names* for each distinct combination seem more necessary than in any other sort of *ideas*: For without a *name*, or *mark*, to distinguish that precise collection, it will hardly be kept from being a heap of confusion. Hence some *Americans* have no distinct *idea* of any number beyond twenty; so that when they are discoursed with of greater numbers, they shew the hairs of their head. So that to reckon right, two things are required:

First, That the mind distinguish carefully two *ideas* which are different one from another only by the addition or substraction of one unit.

Secondly, That it retain in memory the names or marks of the several combinations, from an unit to that number; and that in exact order, as they follow one another. In either

ABSORBENT EARTHS. WATER. ARGILLACEOUS. This mixture easily runs into a glass without any addition.

Lime-water. By solution. It is sometimes found flowing out of the earth in springs; and as it always quits the water when exposed to the air, it is there deposited on the banks of the streams, forming the stony incrustations called *petrifications*. And filtring through the pores of the earth, and dropping through the roof of subterraneous caves, it forms the curious incrustations found hanging from the roof of such places; sometimes assuming forms stupendously magnificent.

AIR. FIXT. *Lime-stone*. It is from the quality that quick-lime has of absorbing its air, and again with it resuming its stony consistence, that it is fitted for a cement in building: and the great hardness of the cements in old buildings is owing to the air being more perfectly united with these than in newer works.

CRYSTALLINE or VITRESCENT EARTHS.

ACIDS: Vitriolic *, and Nitrous *; with the phenomena, &c. as above mentioned.

ALKALI: Fixed, as above.

METALS: Lead, Tin, Copper, and Iron, as above.

SEMI-METALS: Antimony, Bismuth, Arsenic, and Cobalt, as above.

ABSORBENT EARTHS: as above.

ARGILLACEOUS EARTHS. A mass running into glass in a moderate heat.

WATER. Although this is not soluble in water by any operation that we are acquainted with, yet, from its crystalline form, it is probable that it has been once suspended; and certainly it is so at this day in those petrifying springs whose incrustations are of the crystalline sort.

ARGILLACEOUS EARTHS, with Absorbent and Crystalline Earths, as above. With water it only imbibes into a paste of a mechanical nature.

EXPLANATION OF THE TABLES.

[illegible]

[TA]BLE, Shewing the manner in which natural bodies, confidered in a chemical view, may be divided into claffes: With their feveral fubdivifions; their properties defined; and the manner in which they are obtained, pointed out.

[NATUR]AL BODIES, [as th]e ob[jects of CHEM]ISTRY, divided into [six] claffes,

- 1. SALINE. Thefe are foluble in water, fapid, and not inflammable. They are either
  - SIMPLE, are thofe which can be no further analized by chemiftry; and are of two forts, *viz.*
    - ACIDS. Thefe are diftinguifhed by turning fyrup of violets red, and forming with alkalis neutral falts. The different acids yet known are thefe.
      - *Vitriolic.*
        - *Fixed.* The moft ponderous of all fluids next to mercury, and the moft fixed in the fire, and moft powerful as a folvent of all the acids. Obtained chiefly from fulphur by inflammation.
        - *Volatile.* Obtained alfo from fulphur by inflammation, air being admitted during the operation. This acts lefs powerfully as a folvent than when in its fixt ftate.
      - *Nitrous*, or *Aquafortis.* A volatile fluid of a reddifh colour, emitting noxious fumes when in its concentrated ftate. The next acid in ftrength to the vitriolic. Obtained chiefly from nitre.
      - *Muriatic*, or *acid of fea-falt.* A volatile fluid of a beautiful yellow colour. Inferior in power to the former. Obtained from fea-falt.
      - *Vegetable.*
        - *Native.* This is obtained by expreffion or diftillation from vegetables; as lemon-juice, citron, forrel, *&c.*
        - *Fermented.*
          - *Tartar.* A dry hard fubftance, depofited on the fides of veffels in which wine is fermented.
          - *Vinegar.* By allowing any fermentable liquor to proceed in the fermentation till it is paft the vinous ftate. All thefe vegetable acids are much lefs corrofive, and lefs powerful as folvents, than any of the former.
      - *Acid of urine.* Obtained by evaporating urine. This is in a dry form; and much lefs known in arts than the former.
      - *Acid of amber.* Obtained from amber in a folid form. This is likewife little known in arts.
      - *Acid of ants.* Obtained from the animal from which it has its name, by diftillation, in a fluid form. It is alfo little known.
      - *Acid of borax*, or *fedative falt.* Obtained from borax, in a folid ftate and fcaly-like form.
      - *Acid of arfenic.* Obtained likewife from arfenic.
      - *Acid of animals.* Obtained from all animal-fubftances in diftillation.
    - ALKALIS, turn fyrup of violets green, and with acids form neutrals; and are divided into
      - *Fixt*
        - *Vegetable*, or *potafh.* Always obtained from the afhes of burnt vegetables. A deliquefcent falt.
        - *Foffile.* A folid cryftalline falt; fometimes found native, as the natrum of Egypt; and fometimes by burning fea-weed, as kelp.
      - *Volatile.* This is obtained from fal ammoniac, from the foot of burning bodies, and from the putrefactive fermentation. It is naturally in a folid ftate.
  - COMPOUND, confifting of two or more chemical elements. Divided into
    - *Neutral falts.* Thefe are always compofed of an acid and an alkali; and are of many different kinds, as may be feen in the following table.
    - *Metallic falts*, are thofe which are formed by an acid and a metal. The principal of thefe are vitriols; the others may be feen in the following table.
    - *Earthy falts.* Compofed of an acid joined to fome earthy bafis, as in allum and gypfum. See the following table.
    - *Effential falts*, are obtained from vegetables; and contain an acid, joined with the juices of the plant in a particular manner not to be imitated by art. Of this kind is fugar, manna, honey, and others of that fort.
- 2. INFLAMMABLES, are thofe bodies that continue to burn of themfelves if they are once fet on fire. Divided into
  - OILS, are thickifh vifcous fluids, not mifcible with water. Divided into
    - *Animal*, *Vegetable*, both of which are divided into
      - *Expreffed.* Thefe are of a mild and bland tafte, inodorous, and not foluble in alcohol. They are obtained by expreffion; as, oil of olives, rapfeed, almonds, *&c.* Animal-fats are of the fame nature, as is alfo wax.
      - *Effential*, are always obtained by diftillation, and are poffeffed of the tafte and odor of the fubftance from which they are drawn, and are foluble in alcohol. Of this kind are oil of cloves, fpike, *&c.* The oil of ants is an example in the animal-kingdom.
      - *Empyreumatic*, are obtained by a confiderable degree of heat; and are of an acrid tafte and burnt-like flavour, as oil of hartfhorn. Thefe are foluble in fpirit of wine.
    - *Foffile.* Thefe are found in the earth in their native ftate; and are called, when pure, *naptha;* which is of an acrid tafte, and extremely volatile; not mifcible with alcohol. A great many inflammable foffils contain this; as, bitumens, pit-coal, *&c.*
  - SULPHUR, or *brimftone.* A dry friable fubftance, not mifcible with water. It is found in many mineral fubftances, metallic ores, *&c.*; but it is for the moft part obtained from pyrites.
  - ALCOHOL, or *ardent fpirits.* A fluid of an acrid and volatile nature, mifcible with water. Obtained from fermented vegetable juices by diftillation; as, from the juice of the grape, malt-liquors, rice, *&c.*
- 3. METALLIC, are bodies of a hard and folid texture, fufible in the fire, and refuming their proper form after that; not mifcible with water, nor inflammable. Divided into
  - METALS. Thefe are malleable. Divided into
    - *Gold.* The moft ponderous and ductile, and the moft fixed in the fire, of all bodies; of a yellow colour. It is more commonly found in its metallic ftate than any other metal. There is no proper ore of it: But it is found in ores of filver; and almoft all fands contain fome of it.
    - *Silver.* It is of a fhining white colour, and next to gold in weight, malleability, and fixity. Sometimes found in its native ftate; more frequently in that of an ore, with fulphur, fometimes arfenic; affuming different appearances.
    - *Lead.* Of a dull bluifh colour, exceeding foft, and eafily malleable, and next to the foregoing metals in weight. Almoft never found in its metallic ftate; ufually in an ore with fulphur or arfenic, but feldom with fulphur alone. The principal ores of it are the cubic, called *galena*, and the glaffy called *fparr.*
    - *Copper.* Of a reddifh colour; hard and fonorous; admits of being extended greatly under the hammer, either hot or cold. It is difficult of fufion. This is generally found in the ftate of an ore with fulphur. The ores of it are of great variety, and extremely beautiful; blue, red, green, yellow, *&c.*
    - *Tin.* A white foft metal, the lighteft of all this clafs, and very ductile. The ores of this metal are generally arfenical, and affume a cryftalline appearance. The colour moft ufually a dark brown, and fometimes very beautiful.
    - *Iron.* A grey-coloured metal, extremely ductile when hot; the lighteft metal except tin. It is the only metal that admits of being welded, and tempered by cooling. It is found in almoft every body, and its ores are infinitely various.
  - SEMI-METALS, are brittle, and do not ftretch under the hammer; and are,
    - *Mercury.* A white opaque metallic body. Fluid, except in a very intenfe degree of cold; of great gravity, and eafily volatilized in heat. It is fometimes found in its fluid form; but ufually in a beautiful red ore with fulphur, called *cinnabar.*
    - *Zinc.* A bluifh white fubftance, of a fibrous texture, confiderably hard and fonorous, and has a fmall degree of ductility; eafily fufed and volatilized. Lapis calaminaris is its principal ore.
    - *Antimony.* A blackifh fubftance, of a fibrous needle-like texture; hard and brittle, and confiderably heavy; not difficult of fufion, and eafily converted into glafs. Its only ore is with fulphur, which is the crude antimony of the fhops.
    - *Bifmuth*, or tin-glafs. A white, ponderous, hard, brittle, and fonorous body, of a plated texture; eafily fufed and vitrified. It is only reduced to an ore by arfenic. Its appearance much the fame as the regulus.
    - *Arfenic.* A bright fparkling whitifh-coloured femi-metal; of a plated texture, very brittle, and extremely volatile. It is generally found in the ores of other metals.
    - *Platina.* A white femi-metal, refembling filver in its colour; nearly of the fame fpecific gravity and fixity with gold, and refifting the tefts which have ufually been applied for difcovering the purity of gold, fuppofed from hence to be the *fmiris* of the ancients. Found in the Weft Indies. Of its ores we know nothing.
    - *Cobalt.* A brittle femi-metal; fufible in a moderate heat, and eafily converted into a fine blue-coloured glafs called *fmalt.* This is always obtained from an arfenical ore, which is likewife called *cobalt.*
    - *Nickel* A reddifh white fubftance, of a clofe texture, and very bright; eafily fufed, but difficult to vitrify. Of its ores we know nothing.
- 4. EARTHY. Thefe are folid bodies; not foluble in water; not inflammable; and, if fufed in the fire, never again refume their earthy form, but take that of glafs. Divided into
  - ABSORBENT. Thefe are capable of being united with acids; and are either
    - *Calcarious.* Thofe that can be converted into quick-lime.
      - *Lime-ftone*, or *marble.* This is of infinite variety of colours and texture. Marble is the hardeft and fineft. Thofe kinds of lime-ftone which feel unctuous to the touch are generally impregnated with clay; thofe that feel gritty, or where the lime is hard and weighty, contain fand: This is beft for building, the other for manure.
      - *Chalk.* A foft, friable, white fubftance. This is much freer of any heterogeneous mixture than any lime-ftone, and is eafily calcined into quick-lime. This is probably nothing elfe than lime-ftone fuddenly concreted without being cryftallized.
      - *Sea-fhells*, are likewife a calcarious earth, and yield a very fine quick-lime. Thefe are ufed in medicine.
    - *Not calcarious.*
      - *Magnefia alba.* A white earth, ufually found combined with the vitriolic acid, and forming bitter purging falt. It is likewife obtained from the mother-lye of nitre, the afhes of burnt vegetables, *&c.*
      - *Earth of allum.* A particular kind of abforbent earth, found in many places mixed with fulphureous pyrites, as in Yorkfhire, *&c.* Clay of any kind may, by a particular procefs, be converted into this earth.
      - *Earth of animals, &c.* This is obtained by the calcination of animal-fubftances. It can hardly be converted into glafs; and is therefore ufed as a bafis to white enamels, *&c.*
  - CRYSTALLINE, or *Vitrefcent.* Thefe are hard, and ftrike fire with fteel; may be calcined in the fire; but are not foluble in acids.
    - Of this kind are *fand, flint, &c.* found plentifully every where. With alkaline fubftances they are eafily converted into glafs, and hence are termed *vitrefcent.*
    - *Precious ftones* of all kinds are likewife referable to this clafs; but they are of a much greater degree of hardnefs and tranfparency than the others.
  - ARGILLACEOUS. Thefe are diftinguifhed by acquiring a very hard confiftence when formed into a pafte with water, and expofed to a confiderable degree of heat; not foluble in acids.
    - *Common clay;* is of many different colours, but chiefly red or yellow or white. The pureft clay is that which burns white in the fire.
    - *Medical boles*, of different forts. Only a purer kind of clay; fometimes mixed with a little iron or other matters.
    - *Lapis nephriticus*, or fteatite, are indurated clays, found in various parts. Thefe are at firft foft, and readily cut; but turn extremely hard in the air. Many other varieties of thefe earths might be mentioned; but as thefe do not differ in their chemical properties fo much as in their external appearance, and being all mixed with one another, they more properly belong to the natural hiftorian than the chemift.
- 5. WATER, a colourlefs infipid fluid well known.
  - SIMPLE. *Pure rain-water.* This is never perfectly pure, but always contains a fmall portion of mucilaginous matter, which it is impoffible ever to get perfectly feparated.
  - MINERAL, are thofe fpring-waters impregnated with faline fubftances; the diverfity of which is exceeding great; but they all agree in having an acid joined with them. The moft common forts are impregnated with fulphur and iron.
- 6. AIR.
  - ELASTIC. This is a fubtile elaftic fluid, every where furrounding this earth, and forming our atmofphere; and in this ftate may be confidered as a menftruum for water and other volatile bodies; but as it only fufpends them, without altering their qualities, it cannot properly, in this ftate, be confidered as an object of chemiftry.
  - FIXT. This is a fluid, fuppofed to be common air, which is abforbed by bodies, and there fixed; forming with them a true chemical mixt, differing in its properties from what it was without it. The bodies whofe qualities we certainly know to be altered by this, are alkalis and quick-lime; and it is demonftratively prefent in metals; And it is probably owing to it that they retain their metallic form; but experiments are yet wanting here.

A TABLE. Shewing the ſeveral combinations that the SIMPLE CHEMICAL ELEMENTARY BODIES admit of with one another; the compound reſulting from that mixture; and the manner in which the union is effected: With ſome account of the principal uſes to which theſe are applied in arts or manufactures.

N. B. This mark *, put above any word, denotes that there is ſome difficulty in the proceſs, or that the union is not very complete.

The VITRIOLIC ACID may be combined with theſe bodies, viz.

ACIDS.
- NITROUS ACID. A mixture which readily inflames oils. By ſolution, generating heat.
- MURIATIC, VEGETABLE, and all other ACIDS yet known. By ſolution, generating heat. But theſe mixtures are applied to no particular uſe in medicine or arts.

ALKALIS.
- VEGETABLE.
  - *Vitriolated tartar.* By ſolution and cryſtallization, or double elective attraction from a great variety of bodies.
  - *Nitrum vitriolatum.* A vitriolated tartar obtained by diſtilling from nitre with the vitriolic acid.
  - *Sal polychreſtum.* By deflagrating nitre with ſulphur. There are many other kinds of vitriolated tartar, known formerly by different names, and ſuppoſed to be poſſeſſed of particular properties, but they are now neglected.
- FOSSILE. *Glauber's ſalt.* By ſolution and cryſtallization. Much uſed in medicine as a gentle purgative.
- VOLATILE. *Secret ammoniac.* By ſolution. Formerly ſuppoſed a moſt powerful menſtruum for metals, *&c.* but without any juſt foundation.

OILS.
- EXPRESSED. A blackiſh gummy-like maſs. By ſolution, generating a conſiderable heat. Native gums are ſuppoſed to owe their origin to a mixture of this kind
- ESSENTIAL. A dark-coloured reſinous maſs. A great heat and violent effervеſcence being produced by this mixture. Native reſins ſuppoſed the ſame.
- EMPYREUMATIC. Little known. By ſolution.
- FOSSILE. A ſubſtance reſembling amber. By ſolution.

SULPHUR *. Here there is no proper union of ſubſtances: but if ſulphur is boiled in this acid, it becomes leſs inflammable and more fixed than any ordinary ſulphur.

ALCOHOL.
- *Vitriolic æther.* By careful ſolution and diſtillation, the æther being ſeparated by the addition of water.
- *Spiritus vitrioli dulcis.* By ſolution and diſtillation.
- *Oleum diſtillatio dulcis.* By continuing the heat after the æther has ariſen.
- *Oleum anodynum mineralis.* By rediſtilling the reſiduum of the laſt with alcohol. A medicine much celebrated by Hoffman
- *Sulphur.* By puſhing the heat after the oil comes over. It is to be obſerved that this is produced in every combination of this acid with inflammables or metals.

METALS.
- GOLD *. Imperfectly. By a particular proceſs after being ſeparated from aqua regia.
- SILVER *. By ſolution, after it has been precipitated from the nitrous acid by alkalis. The fumes which ariſe in this ſolution are inflammable.
- COPPER. *Blue vitriol.* This is ſometimes a native production, but in this way it is never pure. It is artificially prepared by ſolution in a very concentrated acid, and cryſtallizing it.
- IRON.
  - *Green vitriol*, or *copperas.* Obtained at large by a particular proceſs from pyrites; or by ſolution, *&c.* in a diluted acid. This is the baſis of all black dyes, ink, *&c.* as it ſtrikes a black colour with vegetable aſtringents.
  - *Salt of ſteel.* By calcining the cryſtals of green vitriol till it they are converted into a white powder.
  - *Colcother of vitriol.* By continuing the calcination till it aſſumes a brown colour.
- LEAD.
  - *Saturnus vitriolicus.* A ſolution in a boiling heat, but is again precipitated when cold.
  - An indiſſoluble concrete. By precipitation from the nitrous acid.
- TIN. *Jupiter corroſivus.* By a boiling heat in a concentrated acid.

SEMI-METALS.
- ANTIMONY *. *A metallic ſalt.* By elective attraction from butter of antimony.
- ZINC. *White vitriol.* Often found in its native ſtate. Artificially made by ſolution and cryſtallization in a diluted acid. Uſed by painters for drying.
- BISMUTH. A corroded calx. By ſolution in a concentrated acid.
- ARSENIC. - - - By ditto.
- MERCURY.
  - *Ignis Gehenne*, or infernalis of Paracelſus. By a boiling heat, and repeated coctions with freſh acid when it is evaporated.
  - *Turpeth mineral*, or mercurius precipitatus flavus. By evaporating to drineſs, and then waſhing with water.
- COBALT. A roſe-coloured mixture. By ſolution. If this is precipitated by a fixt alkali, and again diſſolved, the liquor appears of a beautiful red.

EARTHS.
- CALCARIOUS EARTHS.
  - A corroded calx. By ſimple corroſion. This when perfectly edulcorated with water is found to be a true gypſum.
  - *Selenites.* By precipitation from a very dilute ſolution of chalk in the nitrous acid, by means of the vitriolic acid.
  - *Gypſum*, or *Paris-plaſter.* Often found in a native ſtate. May be artificially formed by precipitating from a ſolution of chalk in a very concentrated nitrous acid. Uſed as a cement; for taking impreſſions from medals, *&c.*
  - *Talc, aſbeſtos, &c.* A native production which cannot be perfectly imitated by art. Uſed for holding objects in microſcopes, making incombuſtible cloth, *&c.*
- MAGNESIA. *Epſom*, or *magneſia Glauber's ſalt.* By ſolution and cryſtallization. Much uſed in medicine for the ſame purpoſes as real Glauber's ſalt.
- EARTH of ALUM. *Alum.* By ſolution, cryſtallization, *&c.* Uſed by dyers as a preparatory for taking on the colours, papermakers, goldſmiths, *&c.*
- EARTH of ANIMALS, OSTEOCELLO, *&c.* By ſolution. The mixtures of theſe are not applied to any particular uſe.
- CLAY *. *Alum.* By digeſting pure clay for ſome time in this acid, and expoſing it for ſome time to the air, an alum is produced; and, if the clay is precipitated from this aluminous concrete, it is found to be a pure earth of alum, ſoluble in all acids.
- FLINT *. A thickiſh coagulum. By digeſting the liquor ſilices in the vitriolic acid.

WATER. An acidulated water. Sometimes, though ſeldom, found iſſuing along with native ſprings. Applied to no particular uſe.

NITROUS ACID.

ACIDS.
- VITRIOLIC, as above.
- MURIATIC. *Aqua regia.* By ſolution. This is the only proper menſtruum for gold; and it is a ſolution of tin in this menſtruum which is the baſis of the ſcarlet dye.
- VEGETABLE, and all others. By ditto. Theſe compounds have no particular names, nor are applied to any particular uſes in medicine or arts.

ALKALIS.
- VEGETABLE. *Common nitre.* A native production. Made artificially by ſolution and cryſtallization. This deflagrates with oily or metallic bodies, and is the foundation of gun-powder.
- FOSSILE. *Cubic nitre.* By ſolution.
- VOLATILE. *Nitrous ammoniac.* By ſolution. This differs from all the other ammoniacal ſalts by being ſoluble in alcohol.

OILS.
- EXPRESSED. A thick bituminous-like ſubſtance. Upon the mixture a conſiderable degree of heat is generated, and ſometimes, though very ſeldom, actual flame is produced.
- ESSENTIAL. Ditto. A more violent heat is generated upon the mixture with theſe oils than any other, and with many of them an actual flame is produced.
- EMPYREUMATIC. This mixture has no name, nor is it applied to any remarkable uſe in arts.
- FOSSILE. - - Ditto.

ALCOHOL.
- *Nitrous æther.* By digeſting; the æther ariſing to the ſurface.
- *Spiritus nitri dulcis.* By digeſting a little, and then diſtilling.

METALS.
- GOLD *. *Slightly impregnated.* By a boiling heat in cloſe veſſels, after the ordinary method of ſeparating ſilver from gold by the nitrous acid. It ſpontaneouſly ſubſides in the air.
- SILVER
  - *A fluid ſolution.* By ſolution. This when diluted with water ſtains hair and bones black; as alſo marble, agate, jaſper, *&c.* of different colours.
  - *Sal metallorum.* By ſolution and cryſtallization.
  - *Catharticum lunare*, *lunar cauſtic*, or *lapis infernalis.* By inſpiſſitating the ſolution to drineſs.
- COPPER. A green-coloured ſolution. By ſolution.
- IRON. A greeniſh ſolution, if a diluted acid is employed; if otherwiſe, it is of a yellowiſh colour: evaporated to drineſs, it deliquates in the air.
- LEAD.
  - A yellow ſolution. By diſſolving in a diluted acid. If much water is added, the metal is precipitated.
  - *Saturni fulminans.* By inſpiſſating the ſolution. This explodes when put upon the fire with greater force than nitre, and has been propoſed to be uſed as an ingredient in gun-powder to augment its force.
- TIN. A ſolution or corroded calx. By a careful ſolution without heat it remains ſuſpended; if otherwiſe, it falls down in form of a calx. This is commonly ſuppoſed to be the compoſition uſed in dying ſcarlet; but by miſtake: for it is a ſolution of tin in aqua regia that communicates that fine colour to cochineal. The ſame ſolution is the baſis of the powder which tinges glaſs of a ruby colour. It is the precipitate of gold from aqua regia by means of tin.

SEMI-METALS.
- BISMUTH.
  - A greeniſh ſolution. By uſing a concentrated acid. This might be applied in ſome caſes in the art of dying; but is not yet come into general uſe.
  - *Magiſtery of biſmuth.* By precipitating from the ſolution by means of water. This has been employed as a coſmetic, but is inefficacious and unſafe. If mixed with pometum, this ſtains hair of a dark colour without injuring it.
- MERCURY.
  - A limpid ſolution, intenſely corroſive. By ſolution
  - *Red precipitate.* By evaporating the ſolution to drineſs, and then calcining till it becomes red.
  - *Mercurius corroſivus fuſus.* By precipitating from the nitrous acid by fixt alkali.
  - *White precipitate.* - By ditto with the volatile alkali.
- ZINC. A corroded ſolution. By the ordinary means.
- ANTIMONY.
  - A colourleſs calx. By ſimple corroſion.
  - *Bezoardic mineral.* By diſtilling from butter of antimony, after having added the nitrous acid.
  - *Antimonium diaphoreticum.* By adding nitre to crude antimony, and deflagrating.
  - *Ceruſa antimonii.* By deflagrating regulus of antimony with nitre.
- COBALT.
  - A red liquor. By ſolution either in its calcined or metallic ſtate.
  - *Roſe-coloured cryſtals.* By adding muriatic acid, and allowing it to cryſtallize.
  - *Green ſympathetic ink.* By diſſolving theſe cryſtals in water. The ſolution is red when cold, and green when warm: when wrote with, it diſappears when dry; but when held to the fire it becomes green, and again diſappears when cold.
- NICKEL. A green-coloured liquor. By ſolution.

EARTHS.
- CALCARIOUS.
  - *Deliqueſcent cryſtals.* - By ditto and cryſtallization.
  - *Baldwin's phoſphorus.* By ditto and evaporating to drineſs.
- EARTH of ALUM, and all other abſorbent earths. By ſolution. The compounds have no names nor any remarkable properties hitherto diſcovered.
- CRYSTALLINE EARTHS *. By ſolution after precipitation from the liquor ſilices.

WATER. *Acidulated water.* By ſolution.

ACIDS.
- VITRIOLIC, and NITROUS. As in the former part of this table.
- VEGETABLE, and all others yet known. By ſolution: but as none of theſe mixtures are applied to any particular purpoſe, we take no notice of them.

ALKALIS.
- VEGETABLE. *Digeſtive ſalt.* By ſolution and cryſtallization.
- FOSSILE.
  - *Common ſalt.* Commonly obtained by evaporating ſea-water to drineſs; or artificially made by mixing the acid and alkali, and cryſtallizing.
  - *Sal gem.* A native foſſile ſalt, found in mines in Poland, Spain, *&c.* of the ſame nature as common ſalt, but more pure.
- VOLATILE. *Common ammoniac.* Obtained at large by a particular proceſs from ſoot. Artificially made by mixing the acid and alkali, and cryſtallizing.

OILS *. By ſolution. The union here is but imperfect, nor have they any particular name.

ALCOHOL. *Spiritus ſalis dulcis.* By digeſting, and afterwards diſtilling. The acid here is never totally dulcified.

METALS.
- GOLD *. *A yellow liquor.* By boiling a calx of gold (in whatever way obtained) in this acid. It does not act upon it in its metallic ſtate.
- SILVER *.
  - *A fluid ſolution.* By diſſolving the ore of ſilver in this acid. It does not act upon pure metallic ſilver.
  - *Luna cornea.* By elective attraction from the nitrous acid.
- COPPER. [illegible] By ſolution and inſpiſſating to drineſs.
- IRON. [illegible] By ſolution. [illegible] in ſome meaſure rendered volatile by this operation.
- LEAD. [illegible]

SEMI-METALS.
- [illegible] By precipitation from the nitrous acid.
- MERCURY *. *Corroſive ſublimate.* By ſublimning from ſal ammoniac, common ſalt, or many other bodies.

METALS.
COPPER. *A green deliquescent inflammable salt.* By solution and inspissating to driness.
IRON. *Tinctura martis aurea.* By solution. The iron is in some measure rendered volatile by this operation.
LEAD. *A limpid solution.* By a boiling heat, and frequent cohobations with fresh acid.

SEMI-METALS.
MERCURY *. *Mercurial panacea.* By subliming corr. sub. nine times, and digesting for some time in spirit of wine.
COBALT. A reddish solution. By the ordinary means. It becomes green by a gentle heat.
PLATINA *. A fluid solution. With difficulty effected, after having been precipitated from aqua regia by alkalis.
NICKEL. A green solution. By the ordinary means.

EARTHY.
CALCARIOUS. *Liquid shell.* By solution. A substance whose effects in medicine have been greatly extolled.
Ol. calcis per deliquium. By evaporating liquid shell to driness. It naturally deliquesces.
Fixt ammoniac. By solution and crystallization. This sometimes appears luminous in the dark when struck with a hammer.
OSTEOCELLO, MAGNESIA, and other absorbents. By solution; but the properties or uses of these are not known.

WATER. *Acidulated water.* Generating heat by mixture.

VINEGAR, or VEGETABLE ACID can be combined with these bodies, *viz.*

ACIDS. VITRIOLIC, NITROUS, and MURIATIC, as in the above table. It likewise unites with all other acids, generating heat; but the properties or uses of these are not known.

ALKALIS.
VEGETABLE. *Regenerated tartar.* By solution and crystallization.
FOSSILE. *Polychrest of Rochelle.* By ditto.
VOLATILE. *Spiritus mendarari.* By solution.

OILS *. The union here is imperfect, nor have any of them obtained particular names.

ALCOHOL. A mixture much used for anointing sprains, *&c.*

METALS.
SILVER *. *Lunar caustic.* By dissolving in this acid a precipitate of silver from the vitriolic acid by means of fixt alkali, and evaporating the solution to driness.
COPPER. *Verdegris.* By solution and crystallization; or at large, by stratifying copper plates with the husks of the grape.
IRON. *Sal martis aperiens.* By solution and crystallization.
LEAD. *Ceruse.* By exposing, in certain circumstances, thin plates of lead to the fumes of vinegar.
Saccharum Saturni. By solution and crystallization.
TIN *. This is not properly dissolved; but the acid is evidently impregnated. By the ordinary means of solution.

SEMI-METALS.
ZINC. A colourless solution of a sweetish taste. By digesting for some time.
MERCURY *. *A fluid solution.* By employing a precipitate of mercury from the nitrous acid by alkalis.
A red calx. By long digestion with fluid mercury.
ANTIMONY *. *Vinum benedictum.* This is not a proper solution of the metal, but the acid is impregnated with an emetic quality.
ARSENIC. *Vinum arsenicum.* By ditto.
BISMUTH. An austere stiptic liquor. By strong coction.

EARTHY.
CALCARIOUS EARTHS. *Earthy salts.* Not known in medicine or arts.
MAGNESIA. *Dr Black's purging salt.* By solution. It unites with all the other absorbent earths; but the properties of these mixts are unknown.

WATER. *Acidulated water.*

ACID of URINE.

ACIDS of all kinds. The nature of these not known.

ALKALI. VOLATILE. A glass-like saline substance called *microcosmic salt.* The acid is always found in this state by evaporating urine.

OILS. *Baldwin's phosphorus.* By distilling with substances that contain oils or inflammable matters.

METALS.
LEAD. An inflammable malleable mass. By calcining the dry salt with lead.
TIN. A mass resembling zinc; and inflammable. By ditto.
IRON. A true *phosphorus.* By ditto.
A bluish solution. By employing a watery solution of the acid.
COPPER. A corroded powder, or green solution. By a boiling heat in a watery solution of the acid.

SEMI-METALS.
MERCURY. A semi-opaque mass. By fusion with the acid in its solid form.
ZINC. A corroded powder, soluble in water. By solution in the acid in a watery situation.
A true *phosphorus.* By fusion with the dry acid.
ANTIMONY. A solution in the ordinary way.
A brilliant striated mass. By fusion with the dry acid.
BISMUTH. A mixture but little changed in appearance from ordinary bismuth. By fusion.
ARSENIC. A whitish semi-transparent deliquescent mass. By fusion.
COBALT. A reddish tincture. By solution.

VITRESCENT EARTHS. *Glass of* [illegible]. By fusion.

ACID of AMBER.

ALKALI.
FIXED. A neutral saline mass which would not crystallize. By solution.
VOLATILE. A neutral ammoniacal oleaginous liquor, extremely volatile. By solution with a pure alkali.
Liquor cornu cervi succinatus. By solution, using salt of hartshorn.

OIL. FOSSILE. *Amber.* A native production; but may be again artificially formed by uniting these together by solution.

METALS.
COPPER. It dissolves very slowly in its metallic state; but corrodes it much more readily when calcined.
IRON. Dissolves a part into a colourless liquor, but corrodes a great deal more into a crocus.

SEMI-METAL. ZINC. A fluid solution.

The effects of this acid upon other bodies are not yet known.

ACID of ANTS.

ACIDS of all kinds. The properties not known.

ALKALIS.
FIXED. A deliquescent neutral salt. By solution and crystallization.
VOLATILE. A neutral liquor that would not crystallize.

METALS.
SILVER *. By solution. The calx of silver precipitated from aqua fortis by alkalis; but does not act upon it in its metallic state.
COPPER. Beautiful green crystals. By dissolving and crystallizing calcined copper. It acts slowly upon it in its metallic state.
IRON. A metallic salt. It dissolves this metal with great facility.
LEAD *. A salt resembling Saccharum Saturni. By dissolving the red calx of lead. But it does not act upon it in its metallic state.

SEMI-METAL. ZINC. Elegant crystals. By the ordinary means.

The effects of this acid upon other bodies, or the uses to which these combinations might be applied, are not yet sufficiently known.

ACID of BORAX.
ALKALI. FOSSILE. *Borax.* A native substance, which may be imitated by art. It is of great use in promoting the fusion of metals and earths.
ALCOHOL. A solution with a considerable heat, which burns with a green flame.
WATER. A solution in a considerable heat. The other mixtures with this acid not known.

ACID of ANIMALS.
We know as yet but little of the nature of this acid; and its combinations with other bodies have not hitherto been examined.

The FIXED ALKALI, whether VEGETABLE or FOSSILE, can be united with the following bodies; but the vegetable is best known.

ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable; and acid of Urine, of Amber, of Ants, of Borax; as in the former part of this table.

ALKALIS of all sorts. The uses of these mixtures are not known.

OILS.
EXPRESSED. *Soap.* The best hard soap is made of olive-oil and fossile alkali. The ordinary white soap of this country is made of tallow and potash; black soap, with whale-oil and potash.
ESSENTIAL. *Saponaceous mass.* Best made by pouring spirit of wine upon caustic alkali and then oil, digesting and shaking.
EMPYREUMATIC. This mixture dissolves gold when precipitated from aqua regia; and is the basis of the fine colour called *Prussian blue*; and has various other properties, as yet but little known.
FOSSILE. This has no name, nor are the properties well known; but from some observations that have been made on native soapy waters, it is probable that it would keep linen much longer white than any other kind of soap.

SULPHUR.
Hepar sulphuris. By injecting alkalis upon melted sulphur.
Lac sulphuris. By dissolving sulphur in an alkaline lixivium, and precipitating by an acid.

METALS.
GOLD *. After having precipitated it from aq. regia it dissolves it, if the alkali has been calcined with animal-substances.
SILVER *. After having precipitated it from the nitrous acid, it dissolves it if the alkali has been calcined in contact with the flame.
TIN. A corroded powder. By the ordinary means of solution.
COPPER. By ditto.
LEAD. A fluid solution. By ditto. This stains hair black.
IRON *. A blood-coloured solution. By dropping a solution of iron in the nitrous acid, into an alkaline lixivium.

SEMI-METALS.
MERCURY *. A fluid solution. After precipitating it from acids; if the alkali is in too large proportions, it then dissolves it, especially if the alkali has been calcined in contact with the flame.
ZINC *. By solution, after having precipitated it from the nitrous acid.
BISMUTH *. By solution, after having precipitated it from the nitrous acid.
ANTIMONY.
Kermes mineral. By dissolving antimony in an alkaline lixivium, filtering, and allowing it to stand in a cool place till it precipitates.
Golden sulphur of antimony. By dissolving a crude antimony in an alkaline lixivium, and precipitating by an acid.
Hepar antimonii. By deflagrating crude antimony with nitre.
Crocus metallorum. Is hepar antimonii pulverised and edulcorated with water.
Diaphoretic antimony. By deflagrating regulus of antimony with nitre.
Antimoniated nitre. By dissolving diaphoretic antimony in water, and allowing it to crystallize.
Magistery of antimony. By precipitating a solution of diaphoretic antimony by adding vinegar.
Regulus antimonii medicinalis. By fusing crude antimony with alkali. This is not properly a compound of alkali and antimony, but of another kind. But as it is a term much used, it was proper to explain it.
ARSENIC *. A metallic arsenical salt. By a particular elective attraction from regulus of antimony and nitre.

EARTHS.
CHRYSTALLINE. *Liquor silicum.* By fusion with twice their weight of alkalis.
Glass. By fusion with a much smaller proportion of alkali. This is the composition of crystal glass, and all others commonly used.
ABSORBENTS. Argillaceous, and all kinds of earths. *Glass.* By fusion; differing in quality according to the nature of the ingredients. Glass is likewise produced with it in fusion with metals.

WATER. *Alkaline lixivium.* when caustic, or even the ordinary solution of mild alkali, is a fluid of great power in washing, blacking, *&c.*

AIR. FIXT. *Mild alkali.* This is the general state in which alkalis are found; but if they are rendered caustic by means of quick-lime or otherwise, they again absorb it from the air, or from many other bodies, by elective attraction. When perfectly mild, this alkali may be made to assume a crystalline form.

The VOLATILE ALKALI, or SPIRIT of SAL AMMONIAC, can be united with these bodies, *viz.*

ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable; of Urine, of Amber, of Ants.

ALKALI, as above.

OILS.
EXPRESSED. Has no name. By solution.
ESSENTIAL. *Sal volatile oleosum.* By ditto with some difficulty, unless the alkali is in a caustic state.
EMPYREUMATIC. A pungent oily substance, of great power in medicine. The principal one of this kind in use is spirit of hartshorn.
FOSSILE. A particular kind of soapy substance.

SULPHUR. Smoking spirit of sulphur. By distilling sal ammoniac, quick-lime, and sulphur.

ALCOHOL *. By distilling alcohol from volatile alkalis, it acquires a caustic fiery taste; but the union is not complete.

METALS.
GOLD *. *Aurum fulminans.* A powder obtained by precipitating it from aqua regia by volatile alkalis.
A liquid solution. By adding a large proportion of alkali after it has been precipitated from aqua regia. This deposites the gold when long exposed to the air. The curious vegetation called *arbor Dianæ* is formed by adding mercury to this solution.
SILVER *. A solution. After it has been precipitated from the nitrous acid.
COPPER. A blue-coloured solution. By the ordinary means. This when evaporated to driness, and mixed with tallow, tinges the flame green.
Sapphire-coloured crystals. By crystallizing the solution.
Venus fulminans. By evaporating the solution to driness.
Aqua cerulea sappharina. By mixing sal ammoniac, quick-lime, and thin plates of copper, with water, and allowing them to remain a night.
IRON. By ordinary solution.
LEAD. By ditto.
TIN. The mixts that are produced by these metals are little known.

SEMI-METALS.
BISMUTH *. By solution, after having precipitated it from the nitrous acid.
ANTIMONY.
PLATINA *. By solution, after having precipitated it from aqua regia.
COBALT. A reddish liquor. By solution.
NICKEL. A blue liquor. By ditto.

WATER. This solution might be of use in washing or bleaching; but, unless in particular cases, would be too expensive. It coagulates with alcohol.

AIR. FIXT. Mild volatile alkali. The usual state in which it is found; nor has any method yet been discovered of rendering it solid but in this state.

EXPRESSED OILS.

- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, as in the foregoing part of this table.
- ALKALIS: Fixt, and Volatile, as above.
- OILS: Eſſential, Empyreumatic, and Foſſile. By mixture; but their uſes are not much known.
- SULPHUR. *Balſam of Sulphur.* By ſolution in a boiling heat.
- ALCOHOL. After expreſſed oils are freed from ſoap or plaiſters, they are ſoluble in alcohol; but not in their ordinary ſtate.
- METALS.
  - TIN *. A kind of plaiſter. By ſolution when the tin is in the ſtate of a calx.
  - LEAD *. Ditto. By boiling the calx of lead in oils. This is uſed for cements in water-works. The common white paint is a mixture of this leſs perfect.
- SEMI-METALS. ZINC *. Ditto. By ditto.
- CALCARIOUS EARTHS. Ditto. By mixture when in a cauſtic ſtate.

ENTIAL ILS.

- ACIDS: Vitriolic, Nitrous, &c. as above.
- ALKALIS: Fixt, and Volatile, as above.
- OILS of all kinds. By ſolution or mixture.
- SULPHUR. A balſam of ſulphur. By ſolution, imperfectly: better by adding eſſential oils to the ſolution made by expreſſed oils or hepar ſulphuris.
- ALCOHOL.
  - In perfect mixture. By ſolution.
  - Aromatic waters. By diſtillation.
- METALS.
  - COPPER. By ſolution.
  - LEAD. By ditto.
- WATER. Diſtilled water of the ſhops. By diſtilling recent vegetable ſubſtances with water.

PYREU-ATIC OILS.

- ACIDS: Vitriolic, and Nitrous, as above.
- ALKALIS: Fixt, and Volatile, as above.
- OILS of all kinds. By mixture.
- ALCOHOL. By ſolution. By repeated diſtillations the oils are rendered much more ſubtile.

OSSILE OILS.

- ACIDS: Vitriolic, and Nitrous, as above.
- ALKALIS: Fixt, and Volatile, as above.
- OILS of all kinds. By mixture.
- SULPHUR. With ſome difficulty, by ſolution.
- ALCOHOL. - - - - By ditto.

SULPHUR.

- ACID *: Vitriolic; with the phenomena above deſcribed.
- ALKALIS: Fixt, and Volatile, as above.
- OILS: Expreſſed, Eſſential, and Foſſile, as above.
- METALS.
  - SILVER. A maſs of a red like colour. By adding ſulphur to red-hot ſilver, and fuſing; found alſo with it in the ſtate of an ore.
  - LEAD. A ſparkling friable maſs, hardly fuſible. By deflagrating ſulphur with lead. This in a native ſtate forms the ore of lead called *galena.*
  - COPPER. A black brittle maſs; eaſily fuſed. By adding ſulphur to red-hot copper, or ſtratifying with ſulphur and fuſing. Naturally in ſome yellow pyrites.
  - IRON.
    - A ſpungy-like droſs, eaſily fuſible. By putting ſulphur to red-hot iron. This is alſo found naturally in the common yellow or brown pyrites.
    - A fulminating compound. By mixing filings of iron with ſulphur, moiſtening them with water, and preſſing them hard, they in a few hours burſt out into flame. This compoſition has been employed for imitating earthquakes.
    - *Crocus martis.* By deflagrating with iron.
    - *Crocus martis aperiens.* By calcining the crocus martis in the fire till it aſſumes a red appearance.
    - *Crocus martis aſtringens.* By puſhing the heat ſtill further.
  - TIN. A dark-coloured maſs, reſembling antimony. By fuſion.
- SEMI-METALS.
  - MERCURY.
    - *Ethiops mineral.* By heating flowers of ſulphur, and pouring the mercury upon it, and ſtirring it well. Its natural ore is called *cinnabar.*
    - *Factitious cinnabar.* By applying the mercury and ſulphur to each other in their pure ſtate, and ſubliming.
    - *Cinnabar of antimony.* By ſubliming corroſive ſublimate and crude antimony; or the reſiduum, after diſtilling butter of antimony.
  - BISMUTH. A faint greyiſh maſs, reſembling antimony. By fuſion. If in its metalline ſtate, the ſulphur ſeparates in the cold; but not ſo if the calx has been employed.
  - ANTIMONY. *Crude antimony.* By fuſion.
  - ZINC *. A very brittle, dark-coloured, ſhining ſubſtance. With ſome difficulty, by keeping it long in a moderate fire, and covering it ſeveral times with ſulphur, and keeping it conſtantly ſtirred.
  - ARSENIC.
    - *Yellow arſenic.* By fuſing it with 1-10th its weight of ſulphur.
    - *Red arſenic.* By ditto with 1-5th its weight of ſulphur.
    - *Ruby of ſulphur,* or arſenic, or golden ſulphur. By ſubliming when the proportions are equal.
    - *Orpiment.* A natural production; not perfectly imitable by art; compoſed of ſulphur and arſenic. Much uſed as a yellow paint.
  - NICKEL. A compound; compact and hard as lead; of a bright metallic appearance; internally yellow. By fuſion.
- WATER. *Gas ſylveſtre.* By receiving the fumes of burning ſulphur in water. This ought rather to be called a union of the volatile vitriolic acid with water.

ALCOHOL.

- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, and of Borax, as above.
- ALKALI *: Volatile, as above.
- OILS: Expreſſed, Eſſential, Empyreumatic, and Foſſile, as above.
- METALLIC calces, in ſome particular caſes.
- WATER. By ſolution.

GOLD.

- ACIDS: Vitriolic *, Nitrous *, and Muriatic *. In the circumſtances and with the phenomena above deſcribed.
- ALKALIS: Fixt *, and Volatile *, as above.
- METALS.
  - SILVER. By fuſion. And the ſame is to be underſtood of all the combinations of metals, unleſs particularly ſpecified.
  - LEAD. A very brittle maſs. Gold is rendered pale by the leaſt admixture with this.
  - TIN. Remarkably brittle. The ſmalleſt particle of tin falling upon a furnace renders all the gold or ſilver melted in it extremely brittle.
  - COPPER. Paler and harder than pure gold. This mixture is uſed in all our coins, the copper being called the alloy.
  - IRON. Silver-coloured, hard and brittle; very eaſily fuſed.
- SEMI-METALS.
  - MERCURY. Soft like a paſte called an *amalgamum.* By ſolution; it being in this caſe called *amalgamation*; and the ſame is to be underſtood of the ſolution of any other metal in quick-ſilver.
  - ZINC. A bright and whitiſh compound, admitting of a fine poliſh, and not ſubject to tarniſh; for which qualities it has been propoſed as proper for analyſing ſpeculi for teleſcopes.
  - ARSENIC. Brittle; and the gold is thus rendered a little volatile.
  - ANTIMONY. A fine powder for ſtaining glaſs of a red colour. By calcination.
  - BISMUTH *. A brittle whitiſh regulus; volatile in the fire.
  - PLATINA. Ductile, and of a duſky colour. This has been employed to debaſe gold, as it is of the ſame ſpecific gravity, and is not diſcoverable by the uſual teſts for diſcovering the purity of gold.
  - COBALT.
  - NICKEL. White and brittle.

SILVER.

- ACIDS: Vitriolic *, Nitrous, Muriatic *, Vegetable *, and Acid of Ants *, as above.
- ALKALIS: Fixt *, and Volatile *, as above.
- SULPHUR, as above.
- METALS.
  - GOLD, as above.
  - LEAD. Very brittle.
  - TIN. Extremely brittle, as much ſo as glaſs.
  - COPPER. Harder than ſilver alone. Uſed in ſmall proportions as alloy in coins.
  - IRON. A hard whitiſh compound.
- SEMI-METALS.
  - MERCURY *. By amalgamation with ſilver-leaf, or calx of ſilver precipitated by copper, but not by ſalts. This is uſed for ſilverizing on other metals, in the ſame way as the amalgamum of gold.
  - ZINC. Hard, ſomewhat malleable, and of a white colour.
  - ANTIMONY. A brittle maſs.
  - BISMUTH. A whitiſh ſemi-malleable body.
  - ARSENIC. Brittle; the ſilver being rendered in part volatile.
  - PLATINA. Pretty pure and malleable. Difficult of fuſion; and in part ſeparates when cold.
  - COBALT.
- CHRYSTALLINE EARTHS, and other vitreous matters. A fine yellow opaque glaſs. The fineſt yellow paint for porcelain is procured from a glaſs mixed with ſilver.

LEAD.

- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Ants *, as above.
- ALKALIS: Fixt, and Volatile, as above.
- OILS: Expreſſed *, and Eſſential, as above.
- SULPHUR, as above.
- METALS.
  - GOLD and Silver, as above.
  - TIN. A little harder than either of the metals, and eaſily fuſed: hence it is uſed as a ſolder for lead; and it forms the principal ingredients of pewter. If the fire is long continued, the tin floats on the ſurface.
  - COPPER *. Brittle and granulated, like tempered iron or ſteel when broke. By throwing pieces of copper into melted lead. The union here is very ſlight.
  - IRON *. An opaque browniſh glaſs. By a great degree of heat if the iron has been previouſly reduced to the ſtate of a calx; but never in its metallic ſtate.
- SEMI-METALS.
  - MERCURY *. By amalgamation. Effected only in a melting heat, unleſs ſome biſmuth has been previouſly united with the mercury.
  - ZINC. Hard and brittle. By pouring zinc on melted lead. If the zinc is firſt melted, and the lead injected upon it, it then deflagrates.
  - ANTIMONY *.
  - BISMUTH. A grey-coloured ſemi-malleable body, eaſily fuſed; and thence uſed as a ſolder for lead or tin.
  - ARSENIC.
    - A grey-coloured brittle maſs; eaſily fuſed, and extremely volatile.
    - A hyacinth-coloured glaſs. By fuſion in a conſiderable heat. This glaſs is eaſily fuſed; and is a much more powerful flux than pure glaſs of lead.
  - PLATINA. Of a leafy or fibrous texture, and purpliſh or blue colour, when expoſed to the air. If a large proportion of platina is uſed, it ſeparates in the cold.
  - COBALT. The nature of this compound is not known.
  - NICKEL. A brittle metallic body.
- CRYSTALLINE EARTHS. A thin glaſs. By fuſion in a moderate heat.

TIN.

- ACIDS: Vitriolic *, Nitrous *, Muriatic, Vegetable *, of Urine, as above.
- ALKALIS: Fixt, and Volatile, as above.
- OIL: Expreſſed *, as above.
- SULPHUR, as above.
- METALS.
  - GOLD, Silver, and Lead, as above.
  - COPPER. A brittle maſs. When the copper is in ſmall proportions, it is firmer and harder than pure tin. This in right proportions with a little zinc, forms bell-metal.
  - IRON. A white brittle compound. By heating filings of iron red-hot, and pouring melted tin upon them. A metal reſembling the fineſt ſilver is made of iron, tin, and a certain proportion of arſenic.
- SEMI-METALS.
  - MERCURY. This amalgamum forms foils for mirrors; and forms the yellow pigment called *aurum moſaicum.* By being ſublimed with ſulphur and ſal ammoniac.
  - ZINC. Hard and brittle. When the zinc is in ſmall proportions, it forms a very fine kind of pewter.
  - ANTIMONY *. *Regulus veneris.* By elective attraction from copper and crude antimony.
  - BISMUTH. Bright, hard, and ſonorous, when a ſmall proportion of biſmuth is uſed. This is very eaſily fuſed; and employed as a ſolder.
  - ARSENIC. A ſubſtance in external appearance reſembling zinc.
  - PLATINA. A coarſe hard metal which tarniſhes in the air.
  - COBALT. By fuſion.
  - NICKEL. A brittle metallic maſs.
- CRYSTALLINE EARTHS, or other vitreous matters. An opaque white vitreous maſs, which forms the baſis of white enamels.

- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, of Ants, as above.
- ALKALIS: Fixt, and Volatile, [illegible]
- [illegible]

- METAL.
  - IRON. Harder and paler than copper [illegible]
  - MER[illegible]

ALKALIS: Fixt, and Volatile, ...
OIL: Effential, as above.
SULPHUR, as above.

- METAL. — IRON. Harder and paler than copper. Eafily fufed.
  - MERCURY *. A curious amalgum. Soft at firft, but afterward brittle. By triturating mercury with verdigris, common falt, vinegar, and water.
- SEMI-METALS.
  - ZINC.
    - *Brafs.* Commonly made by cementation with calamine. The larger the proportion of zinc, the paler, harder, and more brittle is the brafs.
    - *Prince's metal, pinfhbeck,* and other metals refembling gold. By employing zinc in fubftance in fmall proportions. The beft pinfhbeck about 1-5th of zinc.
    - *Spelter.* A native fubftance, found in Cornwall, confifting of zinc and copper, and ufed as a folder.
  - ANTIMONY. By fufion.
  - BISMUTH. A palifh brittle mafs. Somewhat refembling filver.
  - ARSENIC. *White copper.* By pouring arfenic, fufed with nitre, upon copper in fufion. If too large a proportion of arfenic is ufed, it makes the compound black and apt to tarnifh.
  - PLATINA. A white and hard compound, which does not tarnifh fo foon as pure copper, and admits of a fine polifh.
  - COBALT. White and brittle.
  - NICKEL. White and brittle, and apt to tarnifh.

IRON.
- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, of Ants, as above.
- ALKALIS: Fixt *, and Volatile, as above.
- SULPHUR, as above.
- METALS: Gold, Silver *, Lead *, Tin, and Copper, as above.
- SEMI-METALS.
  - ZINC. A white fubftance refembling filver.
  - ANTIMONY. The magnetic quality of the iron is totally deftroyed in this compound.
  - BISMUTH. In a ftrong heat, this emitteth flames.
  - ARSENIC. A whitifh, hard, and brittle compound. By fufing with foap or tartar. A metal refembling fine fteel is made by fufing caft iron with a little arfenic and glafs.
  - PLATINA. With caft iron it forms a compound remarkably hard, fomewhat ductile, and fufceptible of a fine polifh.
  - COBALT. A compound remarkably ductile. By fufion in a moderate heat.
  - NICKEL. A brittle mafs.
- VITRESCENT EARTHS. A tranfparent glafs. In general blackifh; but fometimes yellow, green, or blue. The colour is influenced by the degree of heat as well as nature of the ingredients.

MERCURY.
- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable *, of Urine, as above.
- ALKALI: Fixt *, as above.
- SULPHUR, as above.
- METALS: Gold, Silver *, Lead *, Tin, and Copper, as above.
- SEMI-METALS.
  - ZINC. An amalgum. Soft or hard, according to the proportions employed.
  - ANTIMONY *. By melting the regulus, and pouring it upon boiling mercury. By frequently diftilling from this amalgum, the mercury is rendered much more pure, and is then called *animated mercury.*
  - BISMUTH. A filverizing for iron. By putting this amalgum upon iron, and evaporating the mercury. It has much the appearance of filver.
  - PLATINA. The compound refulting from this mixture is not known.
  - COBALT. By mixing firft with nickel, and then adding mercury.

ZINC.
- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, of Ants, as above.
- OIL: Expreffed *, as above.
- SULPHUR *, as above.
- METALS: Gold, Silver, Lead, Tin, Copper, and Iron, as above.
- SEMI-METALS.
  - MERCURY, as above.
  - ANTIMONY. This mixture is applied to no particular ufe.
  - ARSENIC. A black and friable mafs.
  - PLATINA. A hard fubftance.
  - COBALT. The particular nature and properties of this mixt is not known.

ANTIMONY.
- ACIDS: Vitriolic *, Nitrous, Vegetable *, and Urinous. With the phenomena, and by the means above defcribed.
- ALKALIS: Fixed and Volatile, as above.
- SULPHUR, as above.
- METALS: Gold, Silver, Lead, Tin *, Copper, and Iron, as above.
- SEMI-METALS.
  - MERCURY, and Zinc, as above.
  - BISMUTH. A mafs refembling regulus of antimony.
  - ARSENIC. The nature and qualities of this mixt are not known.
  - PLATINA. A hard mafs.
  - COBALT. Nature unknown.
  - NICKEL. Ditto.
- VITREOUS EARTHS. A thin penetrating glafs; which is a powerful flux of metals.

BISMUTH.
- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, and urinous; with the phenomena, *&c.* above defcribed.
- ALKALIS: Fixed *, and Volatile *, as above.
- SULPHUR, as above.
- METALS: Gold, Silver, Lead, Tin, Copper, and Iron, as above.
- SEMI-METALS.
  - MERCURY and ANTIMONY, as above.
  - ARSENIC. Nature not known.
  - PLATINA. This mixture changes its colour much on being expofed to the air.
  - COBALT *. By mixing firft with nickel or regulus of antimony, and then adding cobalt; but it cannot be united by itfelf.
  - NICKEL. This mixt is not known.
- VITREOUS MATTERS. A yellow glafs. The ore of bifmuth affords with thefe a blue glafs; but this is probably owing to fome mixture of cobalt with it.

ARSENIC.
- ACIDS: Vitriolic, Muriatic *, Vegetable *, and Urinous; with the phenomena, *&c.* above mentioned.
- ALKALIS: Fixt, and Volatile; with the phenomena, and by the means mentioned above.
- SULPHUR, as above.
- METALS: Gold, Silver, Lead, Tin, Copper, and iron, as above.
- SEMI-METALS.
  - ZINC, Antimony, and Bifmuth, as above.
  - PLATINA.
  - COBALT.
  - NICKEL. The phenomena attending thefe mixtures have not been as yet particularly obferved.
- VITREOUS MATTERS. A glafs which greatly promotes the fufion of other matters. The arfenic muft firft be prepared by diffolving and precipitating from alkalis.

PLATINA.
- ACIDS: Muriatic *; with the phenomena, *&c.* mentioned above.
- ALKALI: Volatile, as above.
- METALS: Gold, Silver, Tin, Copper, and Iron, as above.
- SEMI-METALS.
  - MERCURY, Zinc, Bifmuth, and Arfenic, as above.
  - COBALT.
  - NICKEL. The phenomena attending thefe mixtures not yet obferved.

COBALT.
- ACIDS: Vitriolic, Nitrous, Muriatic, and Urinous; with the phenomena, *&c.* as above defcribed.
- ALKALI: Volatile, as above.
- METALS: Gold, Silver, Lead, Tin, Copper, and Iron, as above.
- SEMI-METALS.
  - MERCURY *, Zinc, Antimony, Bifmuth *, Arfenic, and Platina, as above.
  - NICKEL. The properties of this compound not known.
- EARTHY. — CALX of FLINT.
  - *Zaffre.* By mixing calcined cobalt with calx of flint, and moiftening them with water, and preffing them clofe in wooden tubs.
  - *Smalt.* By vitrifying thefe with the addition of a little potafh.

NICKEL.
- ACIDS: Nitrous, and Muriatic; with the phenomena, *&c.* as mentioned above.
- ALKALI: Volatile, as above.
- SULPHUR, as above.
- METALS: Gold, Lead, Tin, Copper, and Iron, as above.
- SEMI-METALS: Antimony, Bifmuth, Arfenic, Platina, and Cobalt, as above.

ABSORBENT EARTHS.
- ACIDS: Vitriolic, Nitrous, Muriatic, and Vegetable; with the phenomena, and by the affiftances above mentioned.
- ALKALIS: Fixed, as above.
- EARTHY.
  - CRYSTALLINE. By this mixture they are both much eafier melted into glafs than by themfelves, but not without the addition of fome alkali.
  - ARGILLACEOUS. This mixture eafily runs into a glafs without any addition.
- WATER. — *Lime-water.* By folution. It is fometimes found flowing out of the earth in fprings; and as it always quits the water when expofed to the air, it is there depofited on the banks of the ftreams, forming the ftony incruftations called *petrifications:* And filtring through the pores of the earth, and dropping through the roofs of fubterraneous caves, it forms the curious incruftations found hanging from the roof of fuch places; fometimes affuming forms ftupenduoufly magnificent.
- AIR. — FIXT. *Lime-ftone.* It is from the quality that quick-lime has of abforbing its air, and again with it refuming its ftony confiftence, that it is fitted for a cement in building; and the great hardnefs of the cements in old buildings is owing to the air being more perfectly united with thefe than in newer works.

CRYSTALLINE or VITRESCENT EARTHS.
- ACIDS: Vitriolic *, and Nitrous *; with the phenomena, *&c.* as above mentioned.
- ALKALI: Fixed, as above.
- METALS: Lead, Tin, Copper, and Iron, as above.
- SEMI-METALS: Antimony, Bifmuth, Arfenic, and Cobalt, as above.
- ABSORBENT EARTHS: as above.
- ARGILLACEOUS EARTHS. A mafs running into glafs in a moderate heat.
- WATER. Although this is not foluble in water by any operation that we are acquainted with, yet, from its cryftalline form, it is probable that it has been once fufpended; and certainly it is fo at this day in thofe petrifying fprings whofe incruftations are of the cryftalline fort.

ARGILLACEOUS EARTHS, with Abforbent and Cryftalline Earths, as above. With water it only unites into a pafte of a mechanical nature.

EXPLANATION OF THE TABLES.

It was imagined, that a fyftematic view of the feveral chemical bodies, arranged under diftinct claffes, would be of ufe to convey a clear idea of this fubject to the mind, and ferve to imprefs it better upon the memory of the reader; and with this view the firft table was compofed, the feveral parts of which are fo plain as to admit of no explanation.

The fame caufes induced us to think, that a fyftematic view of the feveral compounds refulting from the mixture of thefe fimple bodies would be agreeable to the public; and on that account the fecond table was compiled; in which we have followed the fame general arrangement as in the firft: Shewing, in the firft place, the feveral bodies with which the vitriolic acid can be combined; then proceeding to the nitrous acid, the muriatic, &c. through all the other claffes, in the fame order as in the foregoing table.--- In the firft column, then, on the left hand, is placed a fimple body, which can be united with fome one or more individuals of each of thofe fpecies which are put in the fecond column, and the particular fubftance of each fpecies with which it can be united is put in the third column; after which is placed the name and properties of the compound, the operation by which they are united, &c. And in the enumeration of thefe bodies with which any one can be combined, they are placed in the fame order as is generally obferved; beginning with acids, and proceeding to alkalis, oils, fulphur, &c. through all the claffes. An example of the manner of reading the table will make all this plain.

At the top of the firft column, on the left hand, is placed the *Vitriolic Acid*, which can be combined with fome particular kind of each of thofe fpecies of bodies enumerated in the fecond column, included within the crotchet oppofite to it. By this it appears that it can be combined with acids, alkalis, oils, fulphur, alcohol, metals, femi-metals, earths, and water. The particular kinds of each clafs with which it can be united are placed in the third column; by which it appears, that of the clafs of acids it can be united with the nitrous acid, and with it form a mixture, the only property of which, that has been obferved, is, that it readily inflames oils. It likewife unites with the muriatic and all other acids, as there mentioned. Under the clafs of alkalis, it appears that it can be united with the vegetable, foffile, and volatile alkalis. With the firft of which it forms the fubftance called *vitriolated tartar*, and the two other fubftances there enumerated, by the operations there mentioned. With the foffile alkali it forms *Glauber's falt;* and with the volatile alkali, *fecret fal ammoniac;* by the means there mentioned. All the other articles throughout the table are to be read in the fame manner.

In the fame way we proceed through the whole of the table, taking each fimple chemical body in its order, and, placing it in the firft column, fhew what others it can be united with. But it is to be obferved, that as we advance in the table we put down only the names of thofe fubftances which have been already examined; becaufe under each of thefe the particular mixts formed by this union have been already defcribed. Thus, looking along the firft column till you come to *Fixt Alkali*, you find in the fecond column, at the top of the crotchet belonging to this article, *Acids*, and, following it, Vitriolic, Nitrous, Muriatic, &c. with a reference to the foregoing parts of the table; and if you look back to the article *Vitriolic Acid*, under the article *Alkalis* in the fecond column, you find both the vegetable and foffile, with the compounds refulting from this mixture, fo that it was unneceffary to repeat it over again under the article *Alkali*. By the fame means the union of this with the nitrous and other acids are found under each particular acid. And the fame method is to be obferved with regard to every reference to the end of the table.

We once propofed to have omitted mentioning any of thefe articles which had been already defcribed, from which the references are made; but were induced to place them as in the table, becaufe by means of thefe it is eafy to fee, at one view, all the bodies that any one particular body can be united with; whereas, without this, if any one had wanted to know this particular, he behoved to have turned to every article that preceded it. For example, if the article *Bifmuth* was to be examined with this view; turn to it, in the firft column near the end; at once you fee with what particular acids, alkalis, fulphur, and metals, it can be joined with: whereas if thefe had been here omitted, it would have been neceffary to have confulted every article preceding it before you could have known which it could, and which it could not be united with.

It is unneceffary to fay much about the ufes that may be made of this table, as they are pretty obvious. The principal one is to fhow, at one view, what bodies any one can be united with, as in the example juft now given. Again, if it was wanted to know if any one particular fubftance could unite with any other particularly fpecified, it is here at once feen. Let it be (*e. g.*) required to know if copper and zinc can be united; turn to the article [illegible] in the firft column, and fearch among the femi-metals; you there find *Zinc*, and fee that this compound forms brafs, prince's-metal, and [illegible]. And in the fame way any other fubftance may be examined. If, on the other hand, by glancing along the compounds (which are here printed in italics) you meet with any particular fubftance whofe compofition you want to know, it is at once difcovered. Thus for example, common nitre has catched your eye. [illegible] pofition you would wifh to be informed. By looking to the left hand, you find [illegible] (which in the firft table is fhewn to be the fame with [illegible]) and by looking to the firft column [illegible] you find the *Nitrous Acid* [illegible] from which you at once are informed that it is compofed of [illegible] and potafh.

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either of which if it fails, the whole business of *numbering* will be disturbed; and there will remain only the confused *idea* of *multitude*; but the *ideas* necessary to distinct numeration will not be attained to.

Of infinity.

The *idea* signified by the name *infinity*, is best examined, by considering to *what* infinity is by the mind attributed, and then *how* it frames it. *Finite* and *infinite*, then, are looked upon as the modes of quantity; and attributed primarily to things that have parts, and are capable of increase or diminution by the *addition* or *substraction* of any the least part. Such are the *ideas* of *space*, *duration*, and *number*.

When we apply this *idea* to the *Supreme Being*, we do it primarily, in respect of his duration and ubiquity; more figuratively, when to his *wisdom*, *power*, *goodness*, and other attributes, which are properly *inexhaustable* and *incomprehensible*: For when we call them infinite, we have no other *idea* of this infinity, but what carries with it some reflection on the *number* or the *extent* of the *acts* or *objects* of God's power and wisdom, which can never be supposed so great, or so many, that these attributes will not always surmount and exceed, though we multiply them in our thoughts with the infinity of *endless number*.

The next thing to be considered, is, *How we come* by the *idea* of infinity. Every one that has any *idea* of any stated lengths of space, as a *foot*, *yard*, &c. finds that he can repeat that *idea*, and join it to *another*, to a *third*, and so on without ever coming to an end of his additions. From this power of enlarging his *idea* of space, he takes the *idea* of infinite space, or *immensity*. By the same power of repeating the *idea* of any length of duration we have in our minds, with all the endless addition of number, we come by the *idea* of *eternity*.

If our *idea* of *infinity* be got by repeating without end our own *ideas*; why do we not attribute it to other *ideas*, as well as those of *space* and *duration*; since they may be as easily and as often repeated in our minds, as the other: Yet no body ever thinks of infinite *sweetness* or *whiteness*, though he can repeat the *idea* of sweet or white as frequently as those of *yard* or *day*. But those *ideas* that have parts, and are capable of increase by the addition of any parts, afford us, by their repetition, an *idea* of infinity; because with the endless repetition there is continued an enlargement, of which there is no end. But it is not so in other *ideas*: For if to the perfect *idea* I have of *white*, I add another of equal whiteness; it enlarges not my *idea* at all. Those *ideas* that consist not of parts, cannot be augmented to what proportion men please, or be stretched beyond what they have received by their senses: But *space*, *duration*, and *number*, being capable of increase by repetition, leave in the mind an *idea* of an endless room for more; and so those *ideas* alone lead the mind towards the thought of infinity.

Of the modes of thinking.

When the the mind turns its view inwards upon itself, *thinking* is the first *idea* that occurs: Wherein it observes a great variety of modifications; and thereof frames to itself distinct *ideas*. Thus the perception annexed to any impression on the body made by an external object, is called *sensation*. When an *idea* recurs without the presence of the object, it is called *remembrance*: When sought after by the mind, and brought again in view, it is *recollection*: When held there long under attentive consideration, it is *contemplation*. When *ideas* float in the mind without regard or reflection, it is called in French *reverie*; our language has scarce a name for it: When the *ideas* are taken notice of, and, as it were, registered in the memory, it is *attention*: When the mind fixes its view on any one *idea*, and considers it on all sides, it is *intention* and *study*. *Sleep*, without dreaming, is rest from all these. And *dreaming* is the perception of *ideas* in the mind, not suggested by any external objects, or known occasions; nor under any choice or conduct of the understanding.

Of the modes of pleasure and pain.

Pleasure and *pain* are simple *ideas*, which we receive both from sensation and reflection. There are thoughts of the mind, as well as sensations, accompanied with pleasure or pain. Their causes are termed *good* or *evil*. *Pleasure* and *pain*, and their causes *good* and *evil*, are the hinges upon which our passions turn; by reflecting on the various modifications or tempers of mind, and the internal sensations which pleasure and pain, good and evil, produce in us, we may thence form to ourselves the *ideas* of our passions. Thus by reflecting upon the thought we have of the delight which any thing is apt to produce in us, we have an *idea* we call *love*: And on the contrary, the thought of the pain which any thing present or absent produces in us, is what we call *hatred*. *Desire* is that uneasiness which a man finds in himself upon the absence of any thing the present enjoyment of which carries the *idea* of delight with it. *Joy* is a delight of the mind arising from the present or assured approaching possession of a good. *Sorrow* is an uneasiness of the mind, upon the thought of a good lost, or the sense of a present evil. *Hope* is a pleasure in the mind, upon the thought of a probable future enjoyment of a thing which is apt to delight. *Fear* is an uneasiness of the mind, upon the thought of a future evil likely to befall us. *Anger* is a discomposure of mind, upon the receipt of injury, with a present purpose of revenge. *Despair* is the thought of the unattainableness of any good. *Envy* is an uneasiness of mind, caused by the consideration of a good we desire, obtained by one we think should not have had it before us.

It is to be considered, that in reference to the passions, the removal or lessening of a pain, is considered and operates as a pleasure; and the loss or diminishing of a pleasure, as a pain. And farther, that the passions in most persons operate on the body, and cause various changes in it; but these being not always sensible, do not make a necessary part of the *idea* of each passion.

Of power.

The mind being every day informed by the senses of the alteration of those simple *ideas* it observes in things without, reflecting also on what passes within itself, and observing

obſerving a conſtant change of its *ideas*, ſometimes by the impreſſions of outward objects upon the ſenſes, and ſometimes by the determination of its own choice; and concluding, from what it has ſo conſtantly obſerved to have been, that the like changes will for the future be made in the ſame things, by the ſame agents, and by the like ways, conſiders in one thing the poſſibility of having any of its ſimple *ideas* changed, and in another the poſſibility of making that change, and ſo comes by that *idea* which which we call *power*. Thus we ſay *fire* has a power to *melt gold*, and make it fluid; and *gold* has a power to be *melted*.

Power thus conſidered, is twofold, *viz.* as able to make, or able to receive any change: the one may be called *active*, the other *paſſive power*. Of *paſſive power* all ſenſible things aboundantly furniſh us with *ideas*, whoſe ſenſible qualities and beings we find to be in a continual flux. Nor have we of *active power* fewer inſtances; ſince whatever change is obſerved, the mind muſt collect a power ſomewhere able to make that change. But yet, if we will conſider it attentively, bodies by our ſenſes do not afford us ſo clear and diſtinct an *idea* of *active* power as we have from reflection on the operations of our minds. For all power relating to action, and there being but two ſorts of *action*, viz. *thinking* and *motion*, let us conſider whence we have the cleareſt *ideas* of the powers which produce theſe actions.

Of *thinking*, body affords us no *idea* at all: It is only from reflection that we have that; neither have we from body any *idea* of the beginning of motion. A body at reſt, affords us no *idea* of any *active* power to move; and when it is ſet in motion itſelf, that motion is rather a paſſion than an action in it. The *idea* of the beginning of motion, we have only by reflection on what paſſes in ourſelves; where we find by experience, that barely by willing it, we can move the parts of our bodies which were before at reſt.

We find in ourſelves a power to begin or forbear, continue or end, ſeveral actions of our minds, and motions of our bodies, barely by a thought, or preference of the mind. This power which the mind has thus to order the conſideration of any *idea*, or the forbearing to conſider it; or to prefer the motion of any part of the body to its reſt, and *vice verſa*, in any particular inſtance, is that we call the *will*; the actual exerciſe of that power is that which we call *volition*, or *willing*, The forbearance or performance of that action, conſequent to ſuch order or command of the mind, is called *voluntary*; and whatſoever action is performed without ſuch a thought of the mind, is called *involuntary*.

The power of perception is that we call the *underſtanding*. *Perception*, which we make the act of the underſtanding, is of three ſorts: *1ſt*, The perception of *ideas* in our minds. *2dly*, The perception of the ſignification of ſigns. *3dly*, The perception of the agreement or diſagreement of any diſtinct *ideas*. Theſe powers of the mind, *viz.* of perceiving and preferring, are uſually called by another name; and the ordinary way of ſpeaking is, that the underſtanding and will are two *faculties* of the mind.

From the conſideration of the extent of the power of the mind over the actions of the man, which every one finds in himſelf, ariſe the *ideas* of *liberty* and *neceſſity*: ſo far as a man has a power to think or not to think, to move or not to move, according to the preference or direction of his own mind, ſo far is a man free. Where-ever any performance or forbearance are not equally in a man's power; where-ever doing, or not doing, will not equally follow upon the preference of his mind; there he is not *free*, though perhaps the action may be *voluntary*, So that the *idea* of *liberty*, is the *idea* of a power in any agent to do or forbear any action, according to the determination or thought of the mind whereby either of them is preferred to the other. Where either of them is not in the power of the agent to be produced by him, according to his volition, there he is not at liberty; that agent is under *neceſſity*. So that *liberty* cannot be where there is no *thought*, no *volition*, no *will*; but there may be thought, there may be will, there may be volition, where there is no *liberty*. Thus a *tennis ball*, whether in motion by the ſtroke of a racket, or lying ſtill at reſt, is not by any one taken to be a free agent. So a man ſtriking himſelf or his friend by a convulſive motion of his arm, which it is not in his power by volition or the direction of his mind to ſtop or forbear; no body thinks he has in this *liberty*; every one pities him, as acting by *neceſſity* and *conſtraint*. Again, ſuppoſe a man be carried whilſt faſt aſleep into a room, where is a perſon he longs to ſee, and be there locked faſt in, beyond his power to get out; he awakes, and is glad to ſee himſelf in ſo deſirable company; which he ſtays willingly in, that is, prefers his ſtaying to going away. Is not this ſtay voluntary? no body will doubt it; and yet being locked faſt in, he is not at liberty to ſtay; he has not freedom to be gone. So that *liberty* is not an *idea* belonging to volition or preferring, but to the perſon having the power of doing, or forbearing to do, according as the mind ſhall chuſe or direct.

As it is in the motions of the body, ſo it is in the thoughts of our minds: where any one is ſuch, that we have power to take it up, or lay it by, according to the preference of the mind, there we are at liberty. A waking man is not at liberty to think, or not to think, no more than he is at liberty whether his body ſhall touch any other or no: But whether he will remove his contemplation from one *idea* to another, is many times in his choice. And then he is, in reſpect of his *ideas*, as much at liberty, as he is in reſpect of bodies he reſts on. He can at pleaſure remove himſelf from one to another: but yet ſome *ideas* to the mind, like ſome motions to the body, are ſuch, as in certain circumſtances it cannot avoid, nor obtain their abſence by the utmoſt effort it can uſe. Thus a man on the rack is not at liberty to lay by the *idea* of *pain*, and entertain other contemplations.

Where-ever thought is wholly wanting, or the power to act or forbear according to the direction of thought, there neceſſity takes place. This in an agent capable of volition, when the beginning or continuation of any action is contrary to the preference of his mind, is called *compulſion*; when the hindering or ſtopping any action is contrary to his volition, it is called reſtraint: Agents that have no thought, no volition at all, are in every thing neceſſary agents.

Of

Of mixed modes.

Mixed *modes* are combinations of *ſimple ideas* of different kinds. The mind being once furniſhed with ſimple *ideas*, can put them together in ſeveral compoſitions, without examining whether they exiſt ſo together in nature. And hence it is, that theſe ideas are called *notions*, as if they had their original and conſtant exiſtence more in the thoughts of men, than in the reality of things: and to form ſuch ideas, it ſufficed that the mind put the parts of them together, and that they were conſiſtent in the underſtanding, without conſidering whether they had any real being. There are three ways whereby we get theſe complex ideas of *mixed modes*.

1*ſt*, By *experience*, and obſervation of things themſelves: Thus by ſeeing two men wreſtle, we get the *idea* of wreſtling.

2*dly*, By *invention*, or voluntary putting together of ſeveral ſimple *ideas* in our own minds: So he that firſt invented *printing*, had an *idea* of it firſt in his mind before it ever exiſted.

3*dly*, By *explaining* the names of actions we never ſaw, or nations we cannot ſee; and by enumerating all thoſe *ideas* which go to the making them up. Thus the mixed mode, which the word *lie* ſtands for, is made up of theſe ſimple *ideas*: 1ſt, *Articulate ſounds*. 2dly, *Certain* ideas *in the mind of the ſpeaker*. 3dly, *Thoſe words, the ſigns of theſe* ideas. 4thly, *Thoſe ſigns put together*, by affirmation or negation, otherwiſe than the *ideas* they ſtand for are in the mind of the ſpeaker. Since languages are made, *complex ideas* are uſually got by the explication of thoſe terms that ſtand for them: for ſince they conſiſt of ſimple *ideas* combined, they may, by words ſtanding for thoſe ſimple *ideas*, be repreſented to the mind of one who underſtands thoſe words, though that combination of ſimple *ideas* was never offered to his mind by the real exiſtence of things.

Mixed modes have their *unity* from an act of the mind, combining thoſe ſeveral ſimple *ideas* together, and conſidering them as one complex one: the mark of this union is one *name* given to that combination. Men ſeldom reckon any number of *ideas* to make one complex one: but ſuch collections as there be names for. Thus the *killing of an old man*, is as fit to be united into one *complex idea*, as that of *a father*; yet there being no name for it, it is not taken for a particular complex *idea*, nor a diſtinct ſpecies of action from that of killing any other man.

Thoſe collections of *ideas* have names generally affixed, which are of frequent uſe in converſation: in which caſes men endeavour to communicate their thoughts to one another with all poſſible diſpatch. Thoſe others, which they have ſeldom occaſion to mention, they tie not together, nor give them names.

This gives the reaſon, why there are words in every language, which cannot be rendered by any one ſingle word of another. For the faſhions and cuſtoms of one nation make ſeveral combinations of *ideas* familiar in one, which another had never any occaſion to make. Such were Οστρακισμὸς among the Greeks, *proſcriptio* among the Romans. This alſo occaſions the *conſtant change* of languages; becauſe the change of cuſtom and opinions brings with it new combinations of *ideas*, which, to avoid long deſcriptions, have new names annexed to them, and ſo they become *new ſpecies* of *mixed* modes.

Of all our ſimple *ideas*, thoſe that have had moſt *mixed modes* made out of them, are *thinking*, and *motion*; which comprehend in them all action; and *power*, from whence theſe actions are conceived to flow. For actions being the great buſineſs of mankind, it is no wonder, if the ſeveral modes of thinking and motion ſhould be taken notice of, the *ideas* of them obſerved and laid up in memory, and have names aſſigned them. For without ſuch *complex ideas* with names to them, men could not eaſily hold any communication about them. Of this kind are the modes of actions diſtinguiſhed by their *cauſes*, *means*, *objects*, *ends*, *inſtruments*, *time*, *place*, and other circumſtances; as alſo of the powers fitted for thoſe actions: thus *boldneſs* is the power to do or ſpeak what we intend, without fear or diſorder; which power of doing any thing, when it has been acquired by the frequent doing the ſame thing, is that *idea* we call *habit*; when forward, and ready upon every occaſion, to break into action, we call it *diſpoſition*: thus *teſtineſs* is a diſpoſition or aptneſs to be angry.

Power being the ſource of all action, the ſubſtances wherein theſe powers are, when they exert this power, are called *cauſes*; and the ſubſtances thereupon produced, or the ſimple *ideas* introduced into any ſubject, *effects*. The efficacy whereby the new ſubſtance or *idea* is produced, is called, in the ſubject exerting that power, *action*; in the ſubject, wherein any ſimple *idea* is changed, or produced, *paſſion*: Which efficacy, in *intellectual agents*, we can conceive to be nothing elſe but modes of thinking and willing; in *corporeal agents*, nothing elſe but modifications of motion.

Of our complex ideas of ſubſtances.

The mind obſerving ſeveral ſimple *ideas* to go conſtantly together, which being preſumed to belong to one thing, are called, ſo united in one ſubject, by one name, which we are apt afterward to talk of and conſider as one ſimple *idea*, which indeed is a complication of many *ideas* together. We imagine not theſe ſimple *ideas* to ſubſiſt by themſelves; but ſuppoſe ſome *ſubſtratum* wherein they ſubſiſt, which we call *ſubſtance*. The *idea* of pure ſubſtance is nothing but the ſuppoſed (but unknown) ſupport of theſe qualities, which are capable of producing ſimple *ideas* in us.

The *ideas* of *particular circumſtances* are compoſed out of this obſcure and general *idea* of ſubſtance, together with ſuch combinations of ſimple *ideas* as are obſerved to exiſt together, and ſupoſed to flow from the internal conſtitution and unknown eſſence of that ſubſtance. Thus we come by the *ideas* of *man*, *horſe*, *gold*, &c. Thus the ſenſible qualities of *iron*, or a *diamond*, make the complex *ideas* of thoſe ſubſtances, which a ſmith or a jeweller commonly knows better than a philoſopher.

The ſame happens concerning the operations of the mind, *viz. thinking*, *reaſoning*, &c. which we concluding not to ſubſiſt by themſelves, nor apprehending how they can belong to body, or be produced by it, we think them

them the actions of some other substance, which we call *spirit*; of whose substance or nature we have as clear a notion as of that of body; the one being but the supposed *substratum* of the simple *ideas* we have from without, as the other of those operations which we experiment in ourselves within: So that the *idea* of *corporeal substance* in matter, is as remote from our conceptions as that of *spiritual substance*.

Hence we may conclude, that he has the perfectest *idea* of any particular substance, who has collected most of those simple *ideas* which do exist in it; among which we are to reckon its *active powers* and *passive capacities*, though not strictly *simple ideas*.

Secondary qualities, for the most part, serve to distinguish substances. For our senses fail us in the discovery of the *bulk*, *figure*, *texture*, &c. of the minute parts of bodies, on which their real constitutions and differences depend; and secondary qualities are nothing but powers, with relation to our senses. The *ideas* that make our complex ones of corporeal substances, are of three sorts: *First*, The *ideas* of primary qualities of things, which are discovered by our senses; such are *bulk*, *figure*, *motion*, &c. *Secondly*, The sensible secondary qualities; which are nothing but powers to produce several *ideas* in us by our senses. *Thirdly*, The aptness we consider in any substance, to cause or receive such alterations of primary qualities, as that the substance so altered should produce in us different *ideas* from what it did before; and they are called *active* and *passive powers*. All which, as far as we have any notice or notion of them, terminate in *simple ideas*.

Had we senses acute enough to discern the minute particles of bodies, it is not to be doubted, but they would produce quite different *ideas* in us; as we find in viewing things with *microscopes*. Such bodies as to our naked eyes are coloured and opaque, will through *microscopes* appear pellucid. *Blood* to the naked eye appears all red; but by a good *microscope* we see only some red globules swimming in a transparent liquor.

Besides these complex *ideas* we have of material substances; by the simple *ideas* taken from the operations of our own minds, which we experiment in ourselves, as *thinking*, *understanding*, *willing*, *knowing*, &c. co-existing in the same substance, we are able to frame the complex *idea* of a *spirit*. And this *idea* of an *immaterial substance*, is as clear as that we have of a *material*. By joining these with substance, of which we have no distinct *idea*, we have the *idea* of a *spirit*: And by putting together the ideas of coherent solid parts, and power of being moved, joined with substance, of which likewise we have no positive *idea*, we have the *idea* of *matter*. The one is as clear and distinct as the other. The substance of *spirit* is unknown to us; and so is the substance of *body* equally unknown to us. Two primary qualities or properties of body, *viz. solid coherent parts*, and *impulse*, we have distinct clear *ideas* of: So likewise have we of two primary qualities or properties of spirit, viz. *thinking*, and a *power of action*. We have also clear and distinct *ideas* of several qualities inherent in bodies, which are but the various modifications of the extension of cohering solid parts and their motion. We have likewise the *ideas* of the several modes of thinking, *viz.* Believing, doubting, hoping, fearing, *&c.* as also of willing and moving the body consequent to it.

Of relation.

There is another set of *ideas* which the mind gets from the *comparing of one thing with another*. When the mind so considers one thing, that it does as it were bring it to and set it by another, and carry its view from one to the other, this is *relation* or *respect*; and the denominations given to things intimating that respect, are what we call *relatives*, and the things so brought together *related*. Thus when I call Cajus, *husband*, or *whiter*, I intimate some other person, or thing, in both cases, with which I compare him. Any of our *ideas* may be the foundation of relation.

Where languages have failed to give correlativen ames, there the relation is not so easily taken notice of: As in *concubine*, which is a relative name as well as *wife*.

The *ideas* of relation may be same in those men who have far different *ideas* of the things that are related. Thus those who have different *ideas* of *man*, may agree in that of *father*.

There is no *idea* of any kind, which is not capable of an almost infinite number of considerations, in reference to other things; and therefore this makes no small part of mens words and thoughts. Thus one single man may at once sustain the relations of *father*, *brother*, *son*, *husband*, *friend*, *subject*, *general*, *European*, *Englishman*, *Islander*, *master*, *servant*, *bigger*, *less*, &c. to an almost infinite number; he being capable of as many relations, as there may be occasions of comparing him to other things in any manner of agreement, disagreement, or respect whatsoever.

Of cause and effect, and other relations.

The *ideas* of *cause* and *effect* we get from our observation of the *vicissitude of things*, while we perceive some qualities or substances begin to exist, and that they receive their existence from the due application and operation of other beings: That which *produces*, is the *cause*; that which is *produced*, the *effect*. Thus *fluidity* in wax is the effect of a certain degree of heat, which we observe to be constantly produced by the application of such heat.

We distinguish the originals of things into two sorts.

First, When the thing is wholly made new, so that no part thereof did ever exist before, as when a new particle of matter doth begin to exist which had before no being, it is called *creation*.

Secondly, When a thing is made up of particles which did all of them before exist, but the thing so constituted of pre-existing particles, which all together make up such a collection of simple *ideas*, had not any existence before, as this *man*, this *egg*, this *rose*, *&c.* this, when referred to a substance produced in the ordinary course of nature by an internal principle, but set on work by some external agent, and working by insensible ways which we perceive not, is called *generation*: When the cause is extrinsical, and the effect produced by a sensible separation, or juxta-position of discernible parts, we call it *making* and such are all artificial things. When any simple *idea* is produced;

duced, which was not in that ſubject before, we call it *alteration.*

The denominations of things taken from *time,* are for the moſt part only relations. Thus when it is ſaid that Queen *Elizabeth* lived ſixty-nine, and reigned forty-five years, no more is meant, than that the duration of her exiſtence was equal to ſixty-nine, and of her government to forty-five annual revolutions of the ſun.

Young and *old,* and other words of time, that are thought to ſtand for poſitive *ideas,* are indeed relative; and intimate a relation to a certain length of duration, whereof we have the *idea* in our minds. Thus we call a man young or old, that has lived little or much of that time that men uſually attain to. This is evident from our application of theſe names to other things; for a *man* is called young at twenty, but a *horſe* old, *&c.* The ſun and ſtars we call not old at all, becauſe we know not what period God has ſet to that ſort of beings.

There are other *ideas,* that are truly *relative,* which we ſignify by names that are thought *poſitive* and *abſolute*; ſuch as *great* and *little, ſtrong* and *weak.* The things thus denominated, are referred to ſome ſtandards, with which we compare them. Thus we call an *apple great,* that is bigger than the ordinary ſort of thoſe we have been uſed to; and a man *weak,* that has not ſo much ſtrength or power to move, as men uſually have.

Of identity and diverſity.

ANOTHER occaſion the mind takes of comparing, is the very *being of things.* When conſidering a thing as exiſting at any certain time, or place, and comparing it with itſelf as exiſting at any other time, *&c.* it forms the *ideas* of *identity* and *diverſity.* When we ſee any thing in any certain time and place, we are ſure it is that very thing, and can be no other, how like ſoever it may be in all other reſpects.

We conceiving it impoſſible that two things of the ſame kind ſhould exiſt together in the ſame place, we conclude, that whatever exiſts any where at the ſame time, excludes all of the ſame kind, and is there itſelf alone. When therefore we demand whether any thing be the *ſame,* or no, it refers always to ſomething that exiſted ſuch a time, in ſuch a place, which it was certain at that inſtant was the ſame with itſelf and no other.

We have *ideas* of three ſorts of ſubſtances: 1ſt, Of *God*; 2dly, *Finite intelligences*; 3dly, *Bodies.*

Firſt, God being eternal, unalterable, and every where, concerning his *indentity* there can be no doubt.

Secondly, Finite ſpirits having had their determinate time and place of beginning to exiſt, the relation to that time and place will always determine to each its *identity,* as long as it exiſts.

Thirdly, The ſame will hold of every particle of matter to which no addition or ſubſtraction is made. Theſe three exclude not one another out of the ſame place, yet each exclude thoſe of the ſame kind out of the ſame place.

The identity and diverſity of *modes* and *relations* are determined after the ſame manner that ſubſtances are; only the actions of finite beings, as *motion* and *thought,* conſiſting in ſucceſſion, they cannot exiſt in different times and places as permanent beings: for no motion or thought, conſidered as at different times, can be the ſame, each part thereof having a different beginning of exiſtence.

From whence it is plain, that exiſtence itſelf is the *principium individuationis,* which determinates a being to a particular time and place incommunicable to two beings of the ſame kind. Thus, ſuppoſe an *atom* exiſting in a determined time and place; it is evident that, conſidered in any inſtant, it is the ſame with itſelf, and will be ſo as long as its exiſtence continues. The ſame may be ſaid of two, or more, or any number of particles, whilſt they continue together. The *maſs* will be the ſame, however jumbled: but if one atom be taken away, it is not the ſame maſs.

In *vegetables,* the identity depends not on the ſame maſs, and is not applied to the ſame thing. The reaſon of this, is the difference between an animate body and maſs of matter; *this* being only the coheſion of particles any how united; *the other,* ſuch a diſpoſition, an organization of parts, as is fit to receive and diſtribute nouriſhment, ſo as to continue and frame the wood, bark, leaves, *&c.* (of an *oak,* for inſtance) in which conſiſts the vegetable life. That therefore which has ſuch an organization of parts partaking of one common life, continues to be the ſame *plant,* though that life be communicated to new particles of matter, vitally united to the living plant. The caſe is not ſo much different in *brutes,* but that any one may hence ſee what makes an *animal,* and continues it the *ſame.*

The identity of the *ſame man* likewiſe conſiſts in a participation of the ſame continued life in ſucceeding particles of matter vitally united to the ſame organized body.

To underſtand *identity* aright, we muſt conſider what *idea* the word it is applied to ſtands for; it being one thing to be the *ſame ſubſtance,* another the *ſame man,* and a third the *ſame perſon.*

An *animal* is a living organized body; and the ſame animal is the ſame continued life communicated to different particles of matter, as they happen ſucceſſively to be united to that organized living body; and our notion of *man* is but of a particular ſort of animal.

Perſon ſtands for an intelligent being, that reaſons and reflects, and can conſider itſelf the ſame thing in different times and places; which it doth by that *conſciouſneſs* that is inſeparable from thinking. By this every one is to himſelf what he calls *ſelf,* without conſidering whether that *ſelf* be continued in the ſame or divers ſubſtances. In this conſiſts *perſonal identity,* or the ſameneſs of a rational being; and ſo far as this conſciouſneſs extends backward to any paſt action or thought, ſo far reaches the identity of that perſon. It is the ſame *ſelf* now, it was then: And it is by the ſame *ſelf,* with this preſent one that now reflects on it, that that action was done.

Self is that conſcious thinking thing, whatever ſubſtance it matters not, which is conſcious of pleaſure or pain, capable of happineſs or miſery; and ſo is concerned for itſelf as far as that conſciouſneſs extends. That with which the conſciouſneſs of this preſent thinking thing can join itſelf, makes the ſame perſon, and is one ſelf with it; and ſo attributes to itſelf and owns all the actions of that thing as its own, as far as that conſciouſneſs reaches.

 This

This *perfonal indentity* is the ubject of reward and punifhment, being that by which every one is concerned for himfelf. If the *confcioufnefs* went along with the little finger, when that was cut off, it would be the fame felf that was juft before concerned for the whole body.

If the fame *Socrates*, waking and fleeping, did not partake of the fame confcioufnefs, they would not be the fame *perfon*. *Socrates* waking, could not be in juftice accountable for what *Socrates* fleeping did, no more than one *twin* for what his brother *twin* did becaufe their outfides were fo like that they could not be diftinguifhed.

But fuppofe I wholly lofe the memory of fome parts of my life, beyond a poffibility of retrieving them, fo that I fhall never be confcious of them again: Am I not the *fame perfon* that did thofe actions, though I have now forgot them? I anfwer, that we muft here take notice what the word *I* is applied to, which in this cafe is the man only: And the fame man being prefumed to be the fame perfon, *I* is eafily here fuppofed to ftand alfo for the fame perfom. But if it be poffible for the fame man to have diftinct incommunicable confcioufnefs at different times, it is paft doubt the fame man would, at different times, make different perfons. Which we fee is the fenfe of mankind in the folemneft declaration of their opinions, human laws not punifhing the mad man for the fober man's actions, nor the fober man for what the mad man did; thereby making them two perfons. Thus we fay in *Englifh*, fuch a one *is not himfelf*, or is *befides himfelf;* in which phrafes it is infinuated, that *felf* is changed, and the *felf-fame perfon* is no longer in that man.

But is not a man drunk or fober the fame perfon? Why elfe is he punifhed for the fame fact he commits when drunk, though he be never afterwards confcious of it? Juft as much the fame perfon, as a man that walks and does other things in his fleep is the fame perfon, and is as anfwerable for any mifchief he fhall do in it. Human laws punifh both with a juftice fuitable to their way of knowledge: Becaufe in thefe cafes they cannot diftinguifh certainly what is real, and what is counterfeit. And fo the ignorance in drunkennefs or fleep, is not admitted as a plea: For though punifhment be annexed to perfonality, and perfonality to confcioufnefs; and the drunkard, perhaps, is not confcious of what he did; yet human judicatures juftly punifh him, becaufe the fact is proved againft him, but want of confcioufnefs cannot be proved for him.

To conclude: Whatever fubftance begins to exift, it muft during its exiftence be the fame. Whatever compofitions of fubftances begin to exift, during the union of thofe fubftances, the concrete muft be the fame. Whatfoever mode begins to exift, during its exiftence it is the fame. And fo if the compofition be of diftinct fubftances, and different modes, the fame rule holds.

Of other relations.

All fimple *ideas*, wherein are parts or degrees, afford an occafion of comparing the fubjects wherein they are to one another, in refpect of thofe fimple *ideas*. As *whiter*, *fweeter*, *more*, *lefs*, &c. Thefe depending on the equality and excefs of the fame fimple *ideas*, in feveral fubjects, may be called *proportional relations*.

Another occafion of comparing things is taken from the circumftances of their origin, as *father*, *fon*, *brother*, &c. Thefe may be called *natural relations*.

Sometimes the foundation of confidering things, is fome act whereby any one comes by a moral right, power, or obligation to do fomething: Such are *general*, *captain*, *burgher*; thefe are *inftituted* and *voluntary relations*, and may be diftinguifhed from the *natural*, in that they are alterable and feparable from the perfons to whom they fometimes belonged, though neither of the fubftances fo related be deftroyed. But natural relations are not alterable, but are as lafting as their fubjects.

Another relation is the conformity or difagreement of mens voluntary actions to a rule to which they are referred, and by which they are judged off: Thefe may be called *moral relations*, It is this conformity or difagreement of our actions to fome law (whereby good or evil is drawn on us from the will and power of the law-maker, and is what we call *reward* or *punifhment*) that renders our actions morally good or evil.

Of thefe moral *rules* or *laws*, there feem to be three forts, with their different enforcements: firft, The *divine law*; fecondly, *Civil law;* thirdly, *The law of opinion* or *reputation*. By their relation to the firft, our actions are either *fins* or *duties;* to the fecond, *criminal* or *innocent*; to the third, *virtues* or *vices*.

Firft, The *divine law*, is that law which God has fet to the actions of men, whether promulgated to them by the light of nature, or the voice of revelation.

That God has given a law to mankind, feems undeniable; fince he has, *firft*, A right to do it; we are his creatures. *Secondly*, Goodnefs and wifdom, to direct our actions to what is beft. *Thirdly*, Power to enforce it by reward, and punifhment of infinite weight and duration. This is the only true touch-ftone of moral rectitude; and by which men judge of the moft confiderable moral good or evil of their actions; that is, whether, as duties or fins, they are like to procure to them happinefs or mifery from the hands of the Almighty.

Secondly, The *civil law* is the rule fet by the commonwealth to the actions of thofe that belong to it. This law nobody over-looks; the rewards and punifhments being ready at hand to enforce it, extending to the protecting or taking away of the life, liberty, and eftate of thofe who obferve or difobey it.

Thirdly, The law of *opinion*, or *reputation*. *Virtue* and *vice* are names fuppofed every where to ftand for actions in their own nature right and wrong. As far as they are really fo applied, they fo far are coincident with the divine law. But it is vifible that thefe names in the particular inftances of their application, through the feveral nations and focieties of men, are conftantly attributed only to fuch actions as in each country and fociety are in reputation or difcredit. So that the meafure of what is every where called and efteemed virtue and vice, is the approbation or diflike, praife or blame, which by a tacit confent eftablifhes itfelf in the focieties and tribes of men in the world;

world; whereby ſeveral actions come to find credit or diſgrace amongſt them, according to the judgment, maxims, or faſhions of the place.

That this is ſo, appears hence: That though that paſſes for virtue in one place, which is elſewhere accounted vice, yet every where *virtue* and *praiſe*, *vice* and *blame*, go together: *Virtue* is every where that which is thought praiſe-worthy; and nothing elſe but that which has the allowance of public eſteem, is called *virtue*. Theſe have ſo cloſe an alliance, that they are often called by the ſame name.

It is true, virtue and vice do, in a great meaſure, every where correſpond with the unchangeable rule of right and wrong, which the laws of God have eſtabliſhed; becauſe the obſervation of theſe laws viſibly ſecures and advances the general good of mankind, and the neglect of them breeds miſchief and confuſion: And therefore men, without renouncing all ſenſe and reaſon, and their own intereſt, could not generally miſtake in placing their commendation and blame on that ſide that deſerved it not.

They who think commendation and diſgrace not ſufficient motives to engage men to accommodate themſelves to the opinions and rules of thoſe with whom they converſe, ſeem little ſkilled in the hiſtory of mankind; the greateſt part whereof govern themſelves chiefly by this *law of faſhion*.

The penalties that attend the breach of God's laws are ſeldom ſeriouſly reflected on; and thoſe that do reflect on them entertain thoughts of future reconciliation; and for the puniſhment due from the laws of the commonwealth, men flatter themſelves with the hopes of impunity: But no man eſcapes cenſure and diſlike, who offends againſt faſhion; nor is there one of ten thouſand ſtiff and inſenſible enough, to bear up under the conſtant diſlike and condemnation of his own club.

Morality then is nothing but a relation to theſe laws or rules: And theſe rules being nothing but a collection of ſeveral ſimple *ideas*, the conformity thereto is but ſo ordering the action, that the ſimple *ideas* belonging to it may correſpond to thoſe which the law requires. By which we ſee, how moral beings and notions are founded on, and terminated in the ſimple *ideas* of ſenſation and reflection. For example; let us conſider the complex *idea* ſignified by the word *murder*. Firſt, from reflection, we have the *ideas* of *willing*, *conſidering*, *purpoſing*, *malice*, &c. alſo of *life*, *perception*, and *ſelf-motion*. Secondly, from ſenſation, we have the *ideas* of *man*, and of ſome action whereby we put an end to that perception and motion in the man: All which ſimple *ideas* are comprehended in the word *murder*.

This collection of ſimple *ideas* being found to agree or diſagree with the eſteem of the country I have been bred in, and to be held worthy of praiſe or blame, I call the action *virtuous* or *vicious*. If I have the will of a ſupreme inviſible Law-maker for my rule; then as I ſuppoſe the action commanded or forbidden by *God*, I call it good or evil, *ſin* or *duty*: If a compare it with the civil law of my country, I call it *lawful* or *unlawful*, a crime or no crime.

Moral actions may be conſidered two ways:

Firſt, As they are in themſelves a collection of ſimple *ideas*; in which ſenſe, they are poſitive abſolute *ideas*.

Secondly, As *good* or *bad*, or *indifferent*: In this reſpect they are *relative*, it being their conformity or diſagreeement with ſome rule that makes them ſo. We ought carefully to diſtinguiſh between the poſitive *idea* of the action, and the reference it has to a rule: Both which are commonly comprehended under one name, which often occaſions confuſion, and miſleads the judgment.

Thus the taking from another what is his, without his conſent, is properly called *ſtealing*: But that name being commonly underſtood to ſignify alſo the moral pravity of the action, men are apt to condemn whatever they hear called *ſtealing* as an ill action diſagreeing with the rule of right. And yet the private taking away his ſword from a madman, to prevent his doing miſchief, though it be properly denominated *ſtealing*, as the name of ſuch a *mixed mode*, yet when compared to the law of God, it is no ſin or tranſgreſſion, though the name *ſtealing* ordinarily carries ſuch an intimation with it.

Of real and fantaſtical ideas.

Our *ideas*, in reference to things from whence they are taken, or which they may be ſuppoſed to repreſent, come under a *threefold* diſtinction; and are, firſt, either *real* or *fantaſtical*; ſecondly, *adequate*, or *inadequate*; thirdly, *true* or *falſe*.

Real ideas, are ſuch as have a foundation in nature, ſuch as have a conformity with the real being and exiſtence of things, or with their archetypes.

Fantaſtical are ſuch as have no foundation in nature, nor any conformity with that reality of being to which they are referred as to their *archetypes*. By examining the ſeveral ſorts of *ideas* we ſhall find, that, firſt our *ſimple ideas* are all real; not that they are images or repreſentations of what does exiſt, but as they are the certain effects of powers in things without us, ordained by our Maker to produce in us ſuch ſenſations: They are real *ideas* in us, whereby we diſtinguiſh the qualities that are really in things themſelves.

Their reality lies in the ſteady correſpondence they have with the diſtinct conſtitutions of real beings. But whether they anſwer to thoſe conſtitutions as to *cauſes* or *patterns*, it matters not; it ſuffices, that they are conſtantly produced by them.

Complex ideas being arbitrary combinations of *ſimple ideas* put together, and united under one general name, in forming of which the mind uſes its liberty, we muſt inquire which of theſe are real, and which imaginary combinations.

Firſt, Mixed modes and relations having no other reality than what they have in the minds of men, nothing elſe is required to make them real, but a poſſibility of exiſting conformable to them. Theſe *ideas* being themſelves *archytypes*, cannot differ from their *archytypes*, and ſo cannot be chimerical; unleſs any one will jumble together in them inconſiſtent *ideas*. Thoſe indeed that have names aſſigned them in any language, muſt have a conformity to the ordinary ſignification of the name that is given

given them, that they may not be thought fantaſtical.

Secondly, Our complex *ideas* of ſubſtances being made, in reference to things exiſting without us, whoſe repreſentations they are thought are no farther real, than as they are ſuch combinations of *ſimple ideas* as are really united, and co-exiſt in things without us: thoſe are fantaſtical which are made up of ſeveral *ideas* that never were found united, as *Centaur*, &c.

Of ideas adequate or inadequate.

REAL *ideas* are either *adequate* or *inadequate*. Firſt, *adequate*; which perfectly repreſent thoſe archetypes which the mind ſuppoſes them taken from, and which it makes them to ſtand for. *Secondly*, *Inadequate*; which are ſuch as do but partially or incompleatly repreſent thoſe archetypes to which they are referred. Whence it appears,

Firſt, That all our *ſimple ideas* are *adequate*; for they being but the effects of certain powers in things fitted and ordained by God to produce ſuch ſenſations in us, they cannot but be correſpondent and adequate to ſuch powers, and we are ſure they agree to the reality of things.

Secondly, Our *complex ideas of modes* being voluntary collections of *ſimple ideas*, which the mind puts together without reference to any real archetypes, cannot but be *adequate ideas*. They are referred to no other pattern, nor made by any original, but the good-liking and will of him that makes the combination. If indeed one would conform his *ideas* to thoſe which are formed by another perſon, they may be wrong or *inadequate*, becauſe they agree not to that which the mind deſigns to be their archetype and pattern; in which reſpect only any *ideas* of modes can be wrong, imperfect, or inadequate.

Thirdly, Our *ideas of ſubſtances* have in the mind a double reference: *Firſt*, They are ſometimes referred to a ſuppoſed real eſſence, of each ſpecies of things; *ſecondly*, They are deſigned for repreſentations in the mind, of things that do exiſt, by *ideas* diſcoverable in them: In both which reſpects they are *inadequate*.

Firſt, If the names of ſubſtances ſtand for things, as ſuppoſed to have certain real eſſences, whereby they are of this or that ſpecies, of which real eſſences men are wholly ignorant; it follows, that the *ideas* they have in their minds, being referred to real eſſences as *archytypes* which are unknown, they muſt be ſo far from being adequate, that they cannot be ſuppoſed to be any repreſentation of them at all. Our complex *ideas* of ſubſtances are nothing but certain collections of ſimple *ideas* that have been obſerved or ſuppoſed conſtantly to exiſt together. But ſuch a complex *idea* cannot be the real eſſence of any ſubſtance: For then the properties we diſcover in it would be deducible from it, and their neceſſary connection with it be known; as all the properties of a *triangle* depend on and are deducible from the complex *idea* of *three lines including a ſpace*: But it is certain, that in our complex *ideas* of ſubſtances are not contained ſuch *ideas* on which all other qualities that are to be found in them depend.

Secondly, Thoſe that take their *ideas* of ſubſtances from their ſenſible qualities, cannot form adequate *ideas* of them: Becauſe their qualities and powers are ſo various, that no man's complex *idea* can contain them all. Moſt of our ſimple *ideas*, whereof our complex ones of ſubſtances do conſiſt, are powers, which being relations to other ſubſtances, we cannot be ſure we know all the powers, till we have tried what changes they are fitted to give and receive from other ſubſtances in their ſeveral ways of application; which being not poſſible to be tried upon one body, much leſs upon all, it is impoſſible we ſhould have adequate *ideas* of any ſubſtance made of a collection of all its properties.

Of true and falſe ideas.

TRUTH and *falſehood*, in propriety of ſpeech, belong only to propoſitions; and when *ideas* are termed *true* or *falſe*, there is ſome ſecret or tacit propoſition which is the foundation of that denomination. Our *ideas* being nothing but *appearances*, or *perceptions* in the mind, can, in ſtrictneſs of ſpeech, no more be ſaid to be true or falſe, than ſingle names of things can be ſaid to be true or falſe. The *idea* of *Centaur* has no more falſehood in it when it appears in our minds, than the name *Centaur* when it is pronounced or writ on paper. For truth or falſehood lying always in ſome affirmation or negation, our *ideas* are not capable, any of them, of being falſe, till the mind paſſes ſome judgment on them, that is, affirms or denies ſomething of them. In a *metaphyſical* ſenſe they may be ſaid to be true, that is, to be really ſuch as they exiſt; though in things called true, even in that ſenſe, there is perhaps a ſecret reference to our *ideas*, looked upon as the ſtandards of that truth; which amounts to a *mental propoſition*.

When the mind refers any of its *ideas* to any thing extraneous to it, they are then capable of being true or falſe: becauſe in ſuch a reference, the mind makes a tacit ſuppoſition of their conformity to that thing; which ſuppoſition, as it is true or falſe, ſo the *ideas* themſelves come to be denominated. This happens in theſe caſes:

1*ſt*, When the mind ſuppoſes its *idea* conformable to that in other mens minds, called by the ſame name, ſuch as that of *juſtice*, *virtue*, &c.

2*dly*, When the mind ſuppoſes any *idea* conformable to ſome real exiſtence. Thus, that of *Man* is true, that of *Centaur* falſe; the one having a conformity to what has really exiſted, the other not.

3*dly*, When the mind refers any of its *ideas* to that real conſtitution and eſſence of any thing whereon all its properties depend: and thus the greateſt part, if not all our *ideas of ſubſtances* are falſe.

As to the *firſt*, when we judge of our *ideas* by their conformity to thoſe of other men, they may be any of them falſe: but ſimple *ideas* are leaſt liable to be ſo miſtaken. We ſeldom miſtake green for blue, or bitter for ſweet; much leſs do we confound the names belonging to different ſenſes, and call a *colour* by the name of a *taſte*. Complex *ideas* are much more liable to falſhood in this particular; and thoſe of mixed modes more than ſubſtances: becauſe in ſubſtances, their ſenſible qualities ſerve, for the moſt part, to diſtinguiſh them clearly; but in mixed modes we are more uncertain, and we may call that *juſtice* which ought to be called by another name. The

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reason of this is, that the abstract *ideas* of mixed modes being mens voluntary combinations of such a precise collection of simple *ideas*, we have nothing else to refer our *ideas* of mixed modes as standards to, but the *ideas* of those who are thought to use names in their proper significations: and so as our *ideas* conform or differ from them, they pass for true or false.

As to the *second*, When we refer our *ideas* to the real existence of things, none can be termed false but our complex *ideas* of substances: for our simple *ideas* being nothing but perceptions in us answerable to certain powers in external objects, their truth consists in nothing but such appearances as are produced in us suitable to those powers: neither do they become liable to the imputation of falsehood, whether we judge these *ideas* to be in the things themselves, or no: for God having set them as marks of distinguishing things, that we may be able to discern one thing from another, and thereby chuse them as we have occasion, it alters not the nature of our simple *ideas*, whether we think the *idea* of *blue* (for instance) to be in the violet itself, or in the mind only: and it is equally from that appearance to be denominated *blue*, whether it be that real colour, or only a peculiar texture in it, that causes in us that *idea*; since the name *blue* notes properly nothing but that mark of distinction that is in a violet, discernible only by our eyes, whatever it consists in.

Neither would our simple *ideas* be *false*, if by the different structure of our organs it were so ordered, that the same object should produce in several mens minds different *ideas*: for this could never be known, since objects would operate constantly after the same manner. It is most probable, nevertheless, that the *ideas* produced by the same objects in different mens minds, are very near and undiscernibly like. Names of simple *ideas* may be misapplied; as a man, ignorant in the *English* tongue, may call *purple*, *scarlet*: but this makes no falsehood in the *idea*.

Complex *ideas* of modes cannot be false, in reference to the essence of any thing really existing; because they have no reference to any pattern existing, or made by nature.

Our complex *ideas* of substances, being all referred to patterns in things themselves, may be false. They are so, 1*st*, When looked upon as representations of the unknown essences of things: 2*dly*, When they put together simple *ideas* which in the real existence of things have no union; as in *centaur*. 3*dly*, When from any collection of simple *ideas*, that do always exist together, there is separated, by a direct negation, any one simple *idea* which is constantly joined with them. Thus, if from extension, solidity, fixedness, malleableness, fusibility, *&c.* we remove the colour observed in *gold*: If this *idea* be only left out of the complex one of *gold*, it is to be looked on as an inadequate and imperfect, rather than a false one; since though it contains not all the simple *ideas* that are united in nature, yet it puts none together but what do really exist together.

Upon the whole, our *ideas*, as they are considered by the mind, either in reference to the proper signification of their names, or in reference to the reality of things, may more properly be called *right* or *wrong ideas*, according as they agree or disagree to those patterns to which they are referred. The *ideas* that are in mens minds, simply considered, cannot be wrong, unless *complex ideas*, wherein inconsistent parts are jumbled together. All other *ideas* are in themselves right, and the knowledge about them right and true knowledge. But when we come to refer them to any patterns, or archetypes, then they are capable of being wrong, as far as they disagree with such archetypes.

Of the association of ideas.

Some of our *ideas* have a natural correspondence and connection one with another: It is the office and excellency of our reason to trace these, and hold them together in that union and correspondence which is founded in their peculiar beings. Besides this, there is another connection of *ideas* wholly owing to chance or custom: *Ideas* that in themselves are not at all of kin, come to be so united in some mens minds, that it is very hard to separate them; they always keep company, and the one no sooner comes into the understanding, but its associate appears with it; and if they are more than two, the whole gang always inseparably shew themselves together. This strong combination of *ideas*, not allied by nature, the mind makes in itself either voluntarily, or by chance: And hence it comes in different men to be very different, according to their different *inclinations*, *educations*, *interests*, &c. Custom settles habits of thinking in the understanding, as well as of determining in the will, and of motions in the body; all which seem to be but trains of motion in the animal spirits, which, once set a-going, continue on in the same steps they have been used to; which by often treading are worn into a smooth path, and the motion in it becomes easy, and, as it were, natural. As far as we can comprehend thinking, thus *ideas* seem to be produced in our minds; or if they are not, this may serve to explain their following one another in an habitual train, when once they are put into that tract, as well as it does to explain such motions of the body.

This connection in our minds of *ideas*, in themselves loose and independent one of another, is of so great force to set us awry in our actions, as well moral as natural, passions, reasonings, and notions themselves, that perhaps there is not any one thing that deserves more to be looked after. Thus the *ideas* of *goblins* and *sprights* have really no more to do with darkness than light; yet let but a foolish maid inculcate these often on the mind of a child, and raise them there together, possibly he shall never be able to separate them again so long as he lives, but darkness shall ever afterwards bring with it those frightful *ideas*. A man has suffered pain or sickness in any place; he saw his friend die in such a room; though these have in nature nothing to do one with another, yet when the *idea* of the *place* occurs to his mind, it brings that of the pain and displeasure with it; he confounds him in his mind, and can as little bear the one as the other.

Intellectual habits and defects this way contracted, are not less frequent and powerful, though less observed. Let the *ideas* of *being* and *matter* be strongly joined either by education or much thought, whilst these are still combined in the mind, what notions, what reasonings will there

there be about ſeparate ſpirits? Let cuſtom from the very childhood have joined figure and ſhape to the *idea* of God, and what abſurdities will that mind be liable to about the Deity? Let the *idea* of *infallibility* be joined to any perſon, and theſe two conſtantly together poſſeſs the mind; and then one body in two places at once ſhall be ſwallowed for a certain truth, whenever that imagined infallible perſon dictates, and demands aſſent without inquiry.

Some ſuch wrong combinations of *ideas* will be found to eſtabliſh the irreconcileable oppoſition between different ſects of philoſophy and religion: for we cannot imagine every one of their followers to impoſe wilfully on himſelf, and knowingly refuſe truth offered by plain reaſon. Intereſt, though it does a great deal in the caſe, yet cannot be thought to work whole ſocieties of men to ſo univerſal a perverſeneſs, as that every one of them ſhould knowingly maintain falſhood; ſome at leaſt muſt be allowed to do what all pretend to, *i e.* to purſue truth ſincerely. That therefore which captivates their reaſons, and leads men of ſincerity blindfold from common ſenſe, will, when examined, be found to be what we are ſpeaking of: ſome independent *ideas*, are by education, cuſtom, and the conſtant din of their party, ſo coupled in their minds, that they always appear there together; and they can no more ſeparate them in their thoughts, than if they were but one *idea*; and they operate as if they were ſo. This gives ſenſe to jargon, demonſtration to abſurdities, and conſiſtency to nonſenſe, and is the foundation of the greateſt errors in the world. The confuſion of two different *ideas*, which a cuſtomary connection of them in their minds hath to them in effect made but one, cannot but fill mens heads with falſe views, and their reaſonings with falſe conſequences.

Of knowledge in general.

SINCE the mind, in all its thoughts and reaſonings, has no other immediate object but its own *ideas*, which alone it does or can contemplate, it is evident that our knowledge is only converſant about them. *Knowledge* then ſeems to be nothing but the perception of the connection and agreement, or diſagreement and repugnancy of any of our *ideas*: where this perception is, there is *knowledge*; and where it is not, there, though we fancy, gueſs, or believe, yet we always come ſhort of *knowledge*. When we know that *white* is not *black*, what do we but perceive that theſe two *ideas* do not agree? Or that the three angles of a *triangle*, are equal to two right ones; what do we more but perceive that equality to two right ones does neceſſarily agree to, and is inſeparable from the three angles of a triangle? But to underſtand a little more diſtinctly wherein this agreement or diſagreement conſiſts, we may reduce it all to theſe *four ſorts*: 1ſt, *Identity* or *diverſity*; 2dly, *Relation*; 3dly, *Coexiſtence*; 4thly, *Real exiſtence*.

1. *Identity* or *diverſity*. It is the firſt act of the mind, *to perceive its* ideas; and ſo far as it perceives them, to know each what it is, and thereby to perceive their difference, that is, the one not to be the other: by this the mind clearly perceives each *idea* to agree with itſelf, and to be what it is; and all diſtinct *ideas* to diſagree. This it does without any pains or deduction, by its natural power of perception and diſtinction. This is what men of art have reduced to thoſe general rules, *viz. what is, is*; and, *it is impoſſible for the ſame thing to be and not to be*. But no *maxim* can make a man know it clearer, that *round* is not *ſqure*, than the bare perception of thoſe two *ideas*, which the mind at firſt ſight perceives to diſagree.

2. The next ſort of agreement or diſagreement the mind perceives in any of its *ideas*, may be called *relative*, and is nothing but the perception of the relation between any two *ideas* of what kind ſoever; that is, their agreement or diſagreement one with another in ſeveral ways the mind takes of comparing them.

3. The third ſort of agreement or diſagreement to be found in our ideas, is, *coexiſtence* or *non-coexiſtence* in the ſame ſubject; and this belongs particularly to ſubſtances. Thus when we pronounce concerning *gold*, that it is fixed, it amounts to no more but this, that fixedneſs, or a power to remain in the fire unconſumed, is an *idea* that always accompanies that particular ſort of *yellowneſs*, *weight*, *fuſibility*, &c. which make our complex *idea* ſignified by the word *gold*.

4. The fourth ſort, is that of actual and *real exiſtence* agreeing to any *idea*. Within theſe four ſorts of agreement or diſagreement, is contained all the knowledge we have, or are capable of. For all that we know or can affirm concerning any *idea*, is, That it is, or is not the ſame with ſome other; as, that *blue is not yellow*: That it does, or does not coexiſt with another in the ſame ſubject; as, that *iron is ſuſceptible of magnetical impreſſions*; That it has that or this relation to ſome other *ideas*; as, That *two triangles, upon equal baſes between two parallels, are equal*: or, that it has a real exiſtence without the mind; as, *that God is*.

There are ſeveral ways wherein the mind is poſſeſſed of truth, each of which is called knowledge. *Firſt*, There is *actual knowledge*, when the mind has a preſent view of the agreement or diſagreement of any of its *ideas*, or of the relation they have one with another. *Secondly*, A man is ſaid to know any propoſition, when having once evidently perceived the agreement or diſagreement of the *ideas* whereof it conſiſts, and ſo lodged it in his memory, that whenever it comes to be reflected on again, the mind aſſents to it without doubt or heſitation, and is certain of the truth of it. And this may be called *habitual knowledge*. And thus a man may be ſaid to know all thoſe truths which are lodged in his memory by a foregoing, clear, and full perception.

Of *habitual knowledge* there are two ſorts: The one is of ſuch truths laid up in the memory, as whenever they occur to the mind, it actually perceives the relation that is between thoſe *ideas*. And this is in all thoſe truths, where the *ideas* themſelves, by an immediate view, diſcover their agreement or diſagreement one with another. The other is of ſuch truths, whereof the mind having been convinced, it retains the memory of the conviction, without the proofs. Thus a man that remembers certainly, that he once perceived the demonſtration, that the three angles of a triangle are equal to two right ones, knows it to be true, when that demonſtration is gone out of

of his mind, and possibly cannot be recollected: But he knows it in a different way from what he did before, namely, not by the intervention of those intermediate *ideas*, whereby the agreement or disagreement of those in the proposition was at first perceived, but by remembring, *i. e.* knowing that he was once certain of the truth of this proposition, that the three angles of a triangle are equal to two right ones. The immutability of the same relations between the same immutable things, is now the *idea* that shews him, that if the three angles of a triangle were once equal to two right ones, they will always be so. And hence he comes to be certain, that what was once true, is always true; what *ideas* once agreed, will always agree; and consequently, what he once knew to be true, he will always know to be true, as long as he can remember that he once knew it.

Of the degrees of our knowledge.

All our knowledge consisting in the view the mind has of its own *ideas*, which is the utmost light and greatest certainty we are capable of, the *different clearness of our knowledge* seems to lie in the different way of perception the mind has of the agreement or disagreement of any of its *ideas*.

When the mind perceives this agreement or disagreement of two *ideas immediately* by themselves, without the intervention of any other, we may call it *intuitive knowledge*; in which cases the mind perceives truth, as the eye does light, only by being directed towards it. Thus the mind perceives, that *white is not black*; that *three are more than two*, and *equal to one and two*. This part of knowledge is irresistible, and, like the bright sun-shine, forces itself immediately to be perceived as soon as ever the mind turns its view that way. It is on this *intuition* that depends all the certainty and evidence of our other knowledge; which certainty every one finds to be so great, that he cannot imagine, and therefore not require a greater.

The next degree of knowledge, is, where the mind perceives not this agreement or disagreement immediately, or by the *juxta-position*, as it were, of the *ideas*, because those *ideas* concerning whose agreement or disagreement the inquiry is made, cannot by the mind be so put together, as to shew it. In this case the mind is fond to discover the agreement or disagreement which it searches, by the intervention of other *ideas*: And this is that which we call *reasoning*. And thus, if we would know the agreement or disagreement in bigness, between the three angles of a triangle, and two right angles, we cannot by an immediate view and comparing them do it; because the three angles of a triangle cannot be brought at once, and be compared with any other one or two angles. And so of this the mind has no immediate or intuitive knowledge. But we must find out some other angles, to which the three angles of a triangle have equality; and finding those equal to two right ones, we come to know the equality of these three angles to two right ones. Those intervening *ideas* which serve to shew the agreement of any two others, are called *proofs*; and where the agreement or disagreement is by this means plainly and clearly perceived, it is called *demonstratiou*. A quickness in the mind to find those proofs, and to apply them right, is that which is called *sagacity*.

This knowledge, though it be certain, is not so clear and evident as *intuitive* knowledge. It requires pains and attention, and steady application of mind, to discover the agreement or disagreement of the *ideas* it considers; and there must be a progression by steps and degrees, before the mind can in this way arrive at certainty. Before demonstration there was a doubt, which, in *intuitive knowledge*, cannot happen to the mind that has its faculty of perception left to a degree capable of distinct *ideas*, no more than it can be a doubt to the eye (that can distinctly see *white* and *black*) whether this ink and paper be all of a colour.

Now, in every step that reason makes in *demonstrative knowledge*, there is an *intuitive knowledge* of that agreement or disagreement it seeks with the next intermediate *idea*, which it uses as a proof; for if it were not so, that yet would need a proof; since without the perception of such agreement or disagreement, there is no knowledge produced. By which it is evident, that every step in reasoning, that produces knowledge, has *intuitive certainty*: which when the mind perceives, there is no more required but to remember it, to make the agreement or disagreement of the *ideas* concerning which we inquire visible and certain. This *intuitive perception* of the agreement or disagreement of the intermediate *ideas* in each step and progression of the demonstration, must also be exactly carried in the mind; and a man must be sure that no part is left out; which because in long deductions the memory cannot easily retain, this knowledge becomes more imperfect than *intuitive*, and men often embrace falsehoods for demonstrations.

It has been generally taken for granted, that *mathematicks* alone are capable of demonstrative certainty. But to have such an agreement or disagreement as may be *intuitively* perceived, being not the privilege of the *ideas* of *number*, *extension*, and *figure* alone, it may possibly be the want of due method and application in us, and not of sufficient evidence in things, that demonstration has been thought to have so little to do in other parts of knowledge: For in whatever *ideas* the mind can perceive the agreement or disagreement immediately, there it is capable of *intuitive knowledge*: And where it can perceive the agreement or disagreement of any two *ideas*, by an *intuitive perception* of the agreement or disagreement they have with any intermediate *ideas*, there the mind is capable of demonstration which is not limited to the *ideas* of figure, number, extension, or their modes. The reason why it has been generally supposed to belong to them only, is, because in comparing their equality or excess the *modes of numbers* have every the least difference very clear and perceivable: And in *extension*, though every the least excess is not so perceptible, yet the mind has found out ways to discover the just equality of two angles, extensions, or figures; and both, that is, numbers and figures, can be set down by visible and lasting marks.

But in other simple *ideas*, whose modes and differences are made and counted by degrees, and not quantity, we have not so nice and accurate a distinction of their differences, as to perceive or find ways to measure their just equality,

equality, or the leaſt differences: For thoſe other ſimple *ideas* being appearances or ſenſations produced in us by the *ſize*, *figure*, *motion*, &c. of minute corpuſcles ſingly inſenſible, their different degrees alſo depend on the variation of ſome, or all of thoſe cauſes; which ſince it cannot be obſerved by us in particles of matter, whereof each is too ſubtile to be perceived, it is impoſſible for us to have any exact meaſures of the different degrees of theſe ſimple *ideas*. Thus, for inſtance, not knowing what number of particles, nor what motion of them, is fit to produce any preciſe degree of *whiteneſs*, we cannot demonſtrate the certain equality of any two degrees of *whiteneſs*, becauſe we have no certain ſtandard to meaſure them by, nor means to diſtinguiſh every the leaſt difference; the only help we have being from our ſenſes, which in this point fail us.

But where the difference is ſo great as to produce in the mind *ideas* clearly diſtinct, there *ideas* of *colours*, as we ſee in different kinds, *blue* and *red*, (for inſtance,) are as capable of demonſtration as *ideas* of number and extenſion. What is here ſaid of colours, holds true in all ſecondary qualities. Theſe two then, *intuition* and *demonſtration*, are the degrees of our *knowledge*; whatever comes ſhort of one of theſe, is but *faith* or *opinion*, not *knowledge*, at leaſt, in all *general truths*. There is, indeed, another perception of the mind employed about the *particular exiſtence of finite beings* without us; which going beyond probability, but not reaching to either of the foregoing degrees of certainty, paſſes under the name of *knowledge*.

Nothing can be more certain, than that the *idea* we receive from an external object is in our minds: This is *intuitive knowledge*; but whether we can thence certainly infer the exiſtence of any thing without us, correſponding to that *idea*, is that whereof ſome men think there may be a queſtion made, becauſe men may have ſuch an *idea* in their minds, when no ſuch things exiſt, no ſuch object affects their ſenſes. But its evident that we are invincibly conſcious to ourſelves of a different perception, when we look upon the *ſun* in the day, and think on it by night; when we actually taſte *wormwood*, or ſmell a *roſe*, or only think on that *ſavour* or *odour*. So that we may add to the two former ſorts of knowledge, this alſo of the exiſtence of particular external objects, by that perception and conſciouſneſs we have of the actual entrance of *ideas* from them, and allow theſe three degrees of knowledge, *viz. intuitive*, *demonſtrative*, and *ſenſitive*.

But ſince our knowledge is founded on, and employed about our *ideas* only, will it follow thence that it muſt be conformable to our *ideas*; and that where our *ideas* are clear and diſtinct, obſcure and confuſed, there our knowledge will be ſo too? *No*. For our knowledge conſiſting in the perception of the agreement or diſagreement of any two *ideas*, its clearneſs or obſcurity conſiſts in the clearneſs or obſcurity of that perception, and not in the clearneſs or obſcurity of the *ideas* themſelves. A man (for inſtance) that has a clear *idea* of the angles of a triangle, and of equality to two right ones, may yet have but an obſcure perception of their agreement; and ſo have but a very obſcure knowledge of it. But obſcure and confuſed *ideas* can never produce any clear or diſtinct knowledge; becauſe, as far as any *ideas* are obſcure or confuſed, ſo far the mind can never perceive clearly whether they agree or diſagree.

Of the extent of human knowledge.

From what has been ſaid concerning knowledge, it follows, *Firſt*, That we can have no knowledge farther than we have *ideas*.

Secondly, That we have no knowledge farther than we can have perception of that agreement or diſagreement of our *ideas*, either by *intuition*, *demonſtration*, or *ſenſation*.

Thirdly, We cannot have an *intuitive* knowledge that ſhall extend itſelf to all our *ideas*, and all that we would know about them, becauſe we cannot examine and perceive all the relations they have one to another, by juxtapoſition, or an immediate compariſon one with another. Thus we cannot *intuitively* perceive the equality of two extenſions, the difference of whoſe figures makes their parts incapable of an exact immediate application.

Fourthly, Our *rational* knowledge cannot reach to the whole extent of our *ideas*; becauſe between two different *ideas* we would examine, we cannot always find ſuch *proofs* as we can connect one to another, with an *intuitive knowledge* in all the parts of the deduction.

Fifthly, *Senſitive* knowledge reaching no farther than the exiſtence of things actually preſent to our ſenſes, is yet much narrower than either of the former.

Sixthly, From all which it is evident, that the *extent of our knowledge*, comes not only ſhort of the reality of *things*, but even of the extent of our own *ideas*. We have the *ideas* of a *ſquare*, a *circle*, and *equality*; and yet, perhaps, ſhall never be able to find a *circle equal to a ſquare*.

The affirmations or negations we make concerning the *ideas* we have, being reduced to the four ſorts above mentioned, *viz. identity*, *coexiſtence*, *relation*, and *real exiſtence*, we ſhall examine how far our knowledge extends in each of theſe.

Firſt, As to *identity and diverſity*, our *intuitive knowledge* is as far extended as our *ideas* themſelves; and there can be no *idea* in the mind, which it does not preſently, by an *intuitive knowledge*, perceived to be what it is, and to be different from any other.

Secondly, As to the agreement or diſagreement of our *ideas* in *coexiſtence*: In this our knowledge is very ſhort; though in this conſiſts the greateſt and moſt material part of our knowledge, concerning *ſubſtances*. For our *ideas* of *ſubſtances* being nothing but certain *collections of ſimple* ideas, *coexiſting in one ſubject*, (our *idea* of *flame*, for inſtance, is a body *hot*, *luminous*, and *moving upward*;) when we would know any thing farther concerning this, or any other ſort of ſubſtance, what do we but inquire what other qualities or powers theſe ſubſtances have, or have not? Which is nothing elſe but to know what other ſimple *ideas* do or do not *coexiſt* with thoſe that make up that complex *idea*. The reaſon of this is, becauſe the ſimple *ideas* which make up our complex *ideas* of ſubſtances, have no viſible neceſſary connection

nection or inconsistence with other simple *ideas* whose coexistence with them we would inform ourselves about. These *ideas* being likewise, for the most part, *secondary qualities*, which depend upon the *primary* qualities of their minute or insensible parts, or on something yet more remote from our comprehension, it is impossible we should know which have a necessary union or inconsistency one with another, since we know not the root from whence they spring, or the size, figure, and texture of parts on which they depend, and from which they result.

Besides this, there is no *discoverable connection* between any *secondary* quality, and those *primary* qualities that it depends on. We are so far from knowing what figure, size, or motion produces (for instance) a *yellow colour*, or *sweet taste*, or a *sharp sound*, that we can by no means conceive how any *size*, *figure*, or *motion* can possibly produce in us the *idea* of any *colour*, *taste*, or *sound* whatsoever; and there is no conceivable connection between the one and the other.

Our knowledge therefore of coexistence reaches little farther than *experience*. Some few, indeed, of the *primary* qualities have a necessary dependence and visible connection one with another; as *figure* necessarily supposes *extension*, *receiving or communicating motion by impulse* supposes *solidity*. But qualities coexistent in any subject, without this dependence and connection, cannot certainly be known to coexist any farther than experience by our senses informs us. Thus, though upon trial we find *gold* yellow, weighty, malleable, fusible, and fixed, yet because none of these have any evident dependence or necessary connection with the other, we cannot certainly know that where any *four* of these are, the *fifth* will be there also, how highly probable soever it may be: But the highest degree of *probability* amounts not to *certainty*; without which there can be no true knowledge: For this coexistence can be no further known, than it is perceived; and it cannot be perceived, but either, in *particular* subjects, by the observation of our senses, or, in *general*, by the necessary connection of the *ideas* themselves.

As to *incompatibility*, or *repugnancy to coexistence*, we may know that any subject can have of each sort of *primary* qualities but one particular at once, one extension, one figure; and so of sensible *ideas*, peculiar to each sense: for whatever of each kind is present in any subject, excludes all other of that sort; for instance, one subject cannot have *two smells* or *two colours* at the same time.

As to *powers of substances*, which make a great part of our inquiries about them, and are no inconsiderable branch of our knowledge; our knowledge as to these reaches little farther than *experience*; because they consist in a texture and motion of parts which we cannot by any means come to discover. *Experience* is that which in this part we must depend on; and it were to be wished that it were more improved.

As to the third sort, the *agreement or disagreement of our ideas in any other relation*, this is the largest field of knowledge, and it is hard to determinate how far it may extend. This part depending on our sagacity in finding intermediate *ideas* that may shew the habitudes and relations of *ideas*, it is an hard matter to tell when we are at the end of such discoveries. They that are ignorant of *algebra*, cannot imagine the wonders in this kind that are to be done by it; and what farther improvements and helps advantageous to other parts of knowledge the sagacious mind of man may yet find out, it is not easy to determine. The *ideas* of *quantity* are not those alone that are capable of demonstration and knowledge; other, and perhaps more useful parts of contemplation, would undoubtedly afford us certainty, if vices, passions, and domineering interest, did not opppse or menace endeavours of this kind

The *idea* of a *Supreme Being*, infinite in power, goodness, and wisdom, whose workmanship we are, and on whom we depend; and the *idea* of *ourselves*, as understanding rational creatures; would, if duely considered, afford such foundations of our *duty*, and *rules of action*, as might place *morality* among the sciences capable of demonstration. The relations of other modes may certainly be perceived, as well as those of number and extension. *Where there is no property, there is no injustice*, is a proposition as certain as any demonstration in *Euclid*: for the *idea* of *property* being a right to any thing; and the *idea* of *injustice* being the invasion or violation of that right; it is evident, that these *ideas* being thus established, and these names annexed to them, we can as certainly know this proposition to be true, as that a *triangle has three angles equal to two right ones*. Again, *No government allows absolute liberty*. The *idea* of *government* being the establishment of society upon certain rules or laws which require conformity to them, and the *idea* of *absolute liberty* being for any one to do whatever he pleases, we are as capable of being certain of the truth of this proposition, as of any in *mathematicks*.

What has given the advantage to the *ideas* of *quality*, and made them thought more capable of certainty and demonstration, is,

First, That they can be represented by sensible marks which have a nearer correspondence with them than any words or sounds. *Diagrams* drawn on paper are copies of the *ideas*, and not liable to the uncertainty that words carry in their signification: But we have no sensible marks that resemble our *moral ideas*, and nothing but words to express them by; which though when written they remain the same, yet the *ideas* they stand for may change in the same man; and it is very seldom that they are not different in different persons.

Secondly, *Moral ideas* are commonly more complex than figures. Whence these two inconveniences follow: *First*, That their names are of more uncertain signification; the precise collection of simple *ideas* they stand for not being so easily agreed on, and so the sign that is used for them in communication always, and in thinking often, does not steadily carry with it the same *idea*. *Secondly*, The mind cannot easily retain those precise combinations so exactly and perfectly as is necessary; in the examination of the habitudes and correspondencies, agreements or disagreements of several of them one with another, especially where it is to be judged off by long deductions, and the intervention of several other complex *ideas*, to shew the agreement or disagreement of two remote ones.

Now one part of these disadvantages in *moral ideas*, which has made them be thought not capable of demonstration, may in a good measure be remedied by *definitions*, setting down that collection of simple *ideas* which every term shall stand for, and then using the terms steadily and constantly for that precise collection.

As to the fourth sort of knowledge, *viz.* of *the real actual existence of things*, we have an *intuitive* knowledge of our *own existence*; a *demonstrative* knowledge of *the existence of God*; and a *sensitive* knowledge of the *objects that present themselves to our senses*.

From what has been said, we may discover the *causes of our ignorance*; which are chiefly these three: *First*, Want of *ideas*: *Secondly*, Want of a discoverable connection beween the *ideas* we have: *Thirdly*, Want of tracing and examining our *ideas*.

First, There are some things we are ignorant of for *want of ideas*. All the simple *ideas* we have are confined to the observations of our senses, and the operations of our own minds that we are conscious of in ourselves. What other *ideas* it is possible other creatures may have, by the assistance of other senses and faculties more or perfecter than we have, or different from ours, it is not for us to determine; but to say or think there are no such, because we conceive nothing of them, is no better an argument, than if a blind man should be positive in it, that there was no such thing as sight and colours, because he had no manner of *idea* of any such thing. What faculties therefore other species of creatures have to penetrate into the nature and inmost constitutions of things, we know not. This we know, and certainly find, that we want other views of them, besides those we have, to make discoveries of them more perfect. The *intellectual* and *sensible* world are in this perfectly alike, that the parts which we see of either of them, hold no proportion with that we see not; and whatsoever we can reach with our eyes or our thoughts of either of them, is but a point almost nothing in comparison of the rest.

Another great cause of ignorance, is the *want of ideas that we are capable of*. This keeps us in ignorance of things we conceive capable of being known. Bulk, figure, and motion we have *ideas* of; yet not knowing what is the particular bulk, motion, and figure of the greatest part of the bodies of the universe, we are ignorant of the several powers, efficacies, and ways of operation, whereby the effects we daily see are produced. These are hid from us in some things, by being *too remote*; in others, by being *too minute*.

When we consider the vast distance of the known and visible parts of the world, and the reasons we have to think that what lies within our ken is but a small part of the immense universe, we shall then discover an huge abyss of ignorance. What are the particular fabricks of the great masses of matter, which make up the whole stupenduous frame of corporeal beings; how far they are extended; and what is their motion, and how continued; and what influence they have upon one another; are contemplations, that at first glimpse our thoughts lose themselves in. If we confine our thoughts to this little system of our sun, and the grosser masses of matter that visibly move about it; what several sorts of vegetables, animals, and intellectual corporeal beings, infinitely different from those of our little spot of earth, may probably be in other *planets*, to the knowledge of which, even of their outward figures and parts, we can no way attain, whilst we are confined to this earth, there being no natural means, either by sensation or reflection, to convey their certain *ideas* into our minds?

There are other bodies in the universe, no less concealed from us by their *minuteness*. These insensible corpuscles being the active parts of matter, and the great instruments of nature on which depend all their *secondary* qualities and operations, our want of precise distinct *ideas* of their *primary* qualities keeps us in incurable ignorance of what we desire to know about them. Did we know the mechanical affections of *rhubarb* and *opium*, we might as easily account for their operations of *purging* or *causing sleep*, as a watchmaker can for the motions of his watch. The dissolving of silver in *aqua fortis*, or *gold* in *aqua regia*, and not *vice versa*, would be then, perhaps, no more difficult to know, than it is to a *smith* to understand why the turning of one key will open a lock, and not the turning of another. But whilst we are destitute of senses acute enough to discover the minute particles of bodies, and to give us *ideas* of their mechanical affections, we must be content to be ignorant of their properties and operations: Nor can we be assured about them any farther than some few trials we make are able to reach; but whether they will succeed again another time, we cannot be certain. This hinders our certain knowledge of universal truths concerning natural bodies; and our reason carries us herein very little beyond particular matters of fact. And therefore, how far soever human industry may advance useful and *experimental philosophy* in physical things, yet *scientifical* will still be out of our reach; because we want perfect and adequate *ideas* of those very bodies which are nearest to us, and most under our command.

This, at first sight, shews us how disproportionate our knowledge is to the whole extent, even of *material* beings; to which if we add the consideration of that infinite number of *spirits* that may be, and probably are, which are yet more remote from our knowledge, whereof we have no cognizance; we shall find this cause of ignorance conceal from us, in an impenetrable obscurity, almost the whole *intellectual* world, a greater certainly, and a more beautiful world than the *material*: For bating some very few *ideas* of spirit we get from our own mind by reflection, and from thence the best we can collect of the *Father of all spirits*, the Author of them and us and all things, we have no certain information so much as of the existence of other spirits but by revelation; much less have we distinct *ideas* of their different natures, states, powers, and several constitutions, wherein they agree or differ one from another, and from us: And therefore in what concerns their different species and properties, we are under an absolute ignorance.

The *second* cause of ignorance, is the *want of discoverable connection* between those *ideas* we have: Where we want that, we are utterly incapable of *universal* and *certain* knowledge: and are, as in the former case, left only to *observation* and *experiment*. Thus the mechanical

nical affections of bodies having no affinity at all with the *ideas* they produce in us, we can have no distinct knowledge of such operations beyond our experience; and can reason no otherwise about them, than as the effects or appointment of an infinitely *wise agent*, which perfectly surpass our comprehensions.

The operation of our minds upon our bodies, is as inconceivable. How any *thought* should produce a motion in *body*, is as remote from the nature of our *ideas*, as how any *body* should produce any *thought* in the *mind*. That it is so, if experience did not convince us, the consideration of the things themselves would never be able in the least to discover to us.

In some of our *ideas* there are certain relations, habitudes, and connections, so visibly included in the nature of the *ideas* themselves, that we cannot conceive them separable from them by any power whatsoever: In these only we are capable of certain and universal knowledge. Thus the *idea* of a *right lined triangle*, necessarily carries with it an *equality of its angles to two right ones*. But the coherence and continuity of the parts of matter, the production of sensation in us of *colours* and *sounds*, &c. by impulse and motion, being such wherein we can discover no natural connection with any *ideas* we have, we cannot but ascribe them to the arbitrary will and good pleasure of the wise Architect.

The things that we observe constantly to proceed regularly, we may conclude to act by a law set them; but yet by a law that we know not; whereby, though causes work steadily, and effects constantly flow from them, yet their connections and dependencies being not discoverable in our *ideas*, we can have but an experimental knowledge of them.

The *third* cause of ignorance, is our *want of tracing those ideas we have* or may have, and finding out those intermediate *ideas* which may shew us what habitude of agreement or disagreement they may have one with another: And thus many are ignorant of *mathematical* truths, for want of application in inquiring, examining, and by due ways comparing those *ideas*.

Hitherto we have examined the *extent* of our knowledge, in respect of the several sorts of beings that are: There is another *extent* of it, in respect of *universality*, which will also deserve to be considered; and in this regard our knowledge follows the nature of our *ideas*. If the *ideas* are *abstract*, whose agreement or disagreement we perceive, our knowledge is *universal*. For what is known of such general *ideas*, will be true of every particular thing in which that *essence*, that is, *abstract idea*, is to be found: And what is once known of such *ideas*, will be perpetually, and for ever true. So that, as to all general knowledge, we must search and find it only in our own minds: And it is only the examining of our own *ideas* that furnishes us with that. Truths belonging to essences of things, (that is, to *abstract ideas*), are *eternal*, and are to be found out by the contemplation only of those essences, as the existence of things is to be known only from experience.

Of the reality of our knowledge.

The reader by this time may be ready to object, If it be true, that all knowledge lies only in the perception of the agreement or disagreement of our own *ideas*, the visions of an *enthusiast*, and the reasonings of a *sober* man, will be equally certain: It is no matter how things are, so a man observe but the agreement of his own imaginations, and talk conformably; it is all truth, all certainty.

To this it is answered, that if our knowledge of our *ideas* should terminate in them, and reach no farther, where there is something farther intended, our most serious thoughts would be of little more use than the *reveries* of a crazy brain. But it is evident, that this way of *certainty*, by the knowledge of our own *ideas*, goes a little farther than bare imagination: and that all the certainty of general truths a man has, lies in nothing else but this knowledge of our *ideas*.

It is evident, that the mind knows not things immediately, but by the intervention of the *ideas* it has of them. Our knowledge therefore is *real*, only so far as there is a conformity between our *ideas* and the reality of things. But how shall we know when our *ideas* agree with things themselves? There are *two sorts* of *ideas*, that we may be assured agree with things: These are,

First, *Simple* ideas; which since the mind can by no means make to itself, must be the effect of things operating upon the mind in a natural way, and producing therein those perceptions, which, by the will of our Maker, they are ordained and adapted to. Hence it follows, that *simple ideas* are not fictions of our fancies, but the natural and regular productions of things without us, really operating upon us; which carry with them all the conformity our state requires, which is to represent things under those appearances they are fitted to produce in us. Thus the *idea* of *whiteness*, as it is in the mind, exactly answers that power which is in any body to produce it there. And this conformity between our *simple ideas*, and the existence of things, is sufficient for real knowledge.

Secondly, All our *complex ideas*, except those of substances, being *archetypes* of the mind's own making, and not referred to the existence of things as to their originals, cannot want any conformity necessary to real knowledge: For that which is not designed to represent any thing but itself, can never be capable of a wrong representation. Here the *ideas* themselves are considered as *archetypes*, and things no otherwise regarded than as they are conformable to them. Thus the *mathematician* considers the truth and properties belonging to a *rectangle*, or *circle*, only as they are *ideas* in his own mind, which possibly he never found existing mathematically, that is, precisely true; yet his knowledge is not only certain, but *real*; because real things are no farther concerned, nor intended to be meant by any such propositions, than as things really agree to those *archetypes* in his mind. It is true of the *idea* of a *triangle*, *that its three angles are equal to two right ones*: It is true also of a *triangle*, wherever it *exists*: What is true of those *figures*, that have barely an *ideal* existence in his mind, will hold true of them also when they come to have a *real* existence in matter.

Hence it follows, that *moral* knowledge is as capable of *real certainty* as *mathematicks*: For *certainty* being nothing

nothing but the perception of the agreement or disagreement of our *ideas*, and demonstration nothing but the perception of such agreement by the intervention of other *ideas*, our *moral ideas*, as well as *mathematical*, being *archetypes* themselves, and so adequate or complete *ideas*, all the agreement or disagreement we shall find in them will produce *real* knowledge, as well as in *mathematical figures*. That which is requisite to make our knowledge *certain*, is the clearness of our *ideas*; and that which is required to make it *real*, is, that they answer their *archetypes*.

Thirdly, But the complex *ideas*, which we refer to *archetypes* without us, may differ from them, and so our knowledge about them may come short of being real; and such are our *ideas* of *substances*. These must be taken from something that does or has existed, and not be made up of *ideas* arbitrarily put together, without any real pattern. Herein, therefore, is founded the reality of our knowledge concerning *substances*, that all our complex *ideas* of them must be such, and such only, as are made up of such simple ones as have been discovered to coexist in nature. And our *ideas* being thus true, tho' not perhaps very exact copies, are the subjects of the *real* knowledge of them. Whatever *ideas* we have, the agreement we find they have with others will be knowledge. If those *ideas* be abstract, it will be *general* knowledge. But to make it *real* concerning *substances*, the *ideas* must be taken from the real existence of things. Wherever, therefore, we perceive the agreement or disagreement of our *ideas*, there is *certain knowledge*: And wherever we are sure those *ideas* agree with the reality of things, there is *certain real knowledge*.

Of truth in general.

TRUTH, in the proper import of the word, signifies the joining or separating of signs, as the things signified by them do agree or disagree one with another. The joining or separating of signs, is what we call *propositions*; so that *truth* properly belongs only to *propositions*: Whereof there are two sorts, *mental* and *verbal*; as there are *two* sorts of signs commonly made use of, *ideas* and *words*.

It is difficult to treat of *mental* propositions without *verbal*; because, in speaking of *mental*, we must make use of *words*, and then they become *verbal*. Again, men commonly in their thoughts and reasonings use *words* instead of *ideas*; especially if the subject of their meditation contains in it *complex ideas*. If we have occasion to form *mental* propositions about *white*, *black*, *circle*, &c. we can, and often do, frame in our minds the *ideas* themselves, without reflecting on the *names*: But when we would consider, or make propositions about the more *complex ideas*, as of a *man*, *vitriol*, *fortitude*, *glory*, &c. we usually put the *name* for the *idea*; because the *idea* these *names* stand for being for the most part confused, imperfect, and undetermined, we reflect on the *names* themselves, as being more clear, certain, and distinct, and readier to occur to our thoughts, than pure *ideas*; and so we make use of these *words* instead of the *ideas* themselves, even when we would meditate and reason within ourselves, and make tacit *mental propositions*.

We must then observe two sorts of *propositions* that we are capable of making: *First*, *Mental propositions*, wherein the *ideas* in our understandings are put together or separated by the mind perceiving or judging of their agreement or disagreement. *Secondly*, *Verbal propositions*; which are words put together or separated in affirmative or negative sentences: So that *proposition* consists in joining or separating signs; and *truth* consists in putting together or separating these signs, according as the things they stand for agree or disagree.

Truth, as well as knowledge, may well come under the distinction of *verbal* and *real*; that being only *verbal truth*, wherein terms are joined according to the agreement or disagreement of the *ideas* they stand for, without regarding whether our *ideas* are such as really have or are capable of having an existence in nature. But then it is they contain *real truth*, when these signs are joined as our *ideas* agree: and when our ideas are such as, we know, are capable of having an existence in nature; which in substances we cannot know, but by knowing that such have existed. *Truth* is the marking down in words the agreement or disagreement of *ideas* as it is: *Falsehood* is the marking down in words the agreement or disagreement of *ideas* otherwise than it is; and so for as these *ideas*, thus marked by sounds, agree to their *archetypes*, so far only is the *truth real*. The knowledge of this *truth* consists in knowing what *ideas* the words stand for, and the perception of the agreement or disagreement of those *ideas*, according as it is marked by those words.

Besides *truth* taken in the strict sense before mentioned, there are other sorts of *truths*: As, *first*, *Moral truth*; which is speaking things according to the persuasion of our own minds. *Secondly*, *Metaphysical truth*; which is nothing but the real existence of things conformable to the *ideas* to which we have annexed their names.

These considerations of *truth* either having been before taken notice of, or not being much to our present purpose, it may suffice here only to have mentioned them.

Of our knowledge of existence.

HITHERTO we have only considered the *essences* of things; which being only *abstract ideas*, and thereby removed in our thoughts from particular existence, give us no knowledge of *existence* at all. We proceed now to inquire concerning our *knowledge of the existence* of things, and how we come by it.

We have the knowledge of our *own existence* by *intuition*; of *the existence of God*, by *demonstration*; and of *other things*, by *sensation*. As for our *own existence*, we perceive it so plainly, that it neither needs, nor is capable of any proof. *I think*, *I reason*, *I feel pleasure and pain*: can any of these be more evident to me than my *own existence?* If I doubt of all other things, that very *doubt* makes me perceive my *own existence*, and will not suffer me to doubt of that. If I know I doubt, I have as certain a perception of the *thing* doubting, as of that *thought* which I call *doubt*. Experience then convinces us, that we have an *intuitive knowledge of our own existence*; and an internal infallible perception that we *are*. In every act of sensation, reasoning, or thinking, we are conscious to ourselves of our own being; and

and in this matter come not ſhort of the higheſt degree of certainty.

Of our knowledge of the exiſtence of a God.

THOUGH *God* has given us no *innate ideas* of himſelf, yet having furniſhed us with thoſe faculties our minds are endowed with, he hath not *left himſelf without a witneſs*, ſince we have ſenſe, perception, and reaſon, and cannot want a clear proof of him as long as we carry ourſelves about us. Nor can we juſtly complain of our ignorance in this great point, ſince he has ſo plentifully provided us with means to diſcover and know him, ſo far as is neceſſary to the end of our being, and the great concernment of our happineſs. But though this be the moſt obvious truth that reaſon diſcovers, yet it requires thought and attention; and the mind muſt apply itſelf to a regular deduction of it, from ſome part of our *intuitive* knowledge; or elſe we ſhall be as ignorant of this, as of other propoſitions which are in themſelves capable of clear demonſtration. To ſhew, therefore, that we are capable of knowing, that is, *being certain*, that *there is a God*, and how we may come by this certainty, we need go no farther that ourſelves, and that undoubted knowledge we have of our own *exiſtence*. It is beyond queſtion, that *man has a clear perception of his own being:* He knows certainly that he exiſts, and that he is ſomething. In the next place, man knows by an *intuitive* certainty, that *bare nothing can no more produce any real being, than it can be equal to two right angles*. If therefore, we know there is ſome real being, it is an evident demonſtration, that *from eternity there has been ſomething*; ſince what was not from eternity had a beginning; and what had a beginning, muſt be produced by ſomething elſe. Next, it is evident, that *what has its being from another, muſt alſo have all that which is in and belongs to its being from another too:* All the powers it has, muſt be owing to, and received from the ſame ſource. This eternal ſource then of all being muſt be alſo the ſource and original of all power; and ſo this *eternal Being* muſt be alſo the *moſt powerful*.

Again, man finds in himſelf *perception* and *knowledge:* We are certain, then, that there is not only ſome being, but ſome knowing intelligent being in the world. There was a time, then, when there was no knowing being, or elſe there has been a knowing being from eternity. If it be ſaid, there was a time when that eternal being had no knowledge; the reply is, that then it is impoſſible there ſhould have ever been any knowledge; it being as impoſſible that things wholly void of knowledge, and operating blindly, and without any perception, ſhould produce a knowing being, as it is that a triangle ſhould make itſelf three angles bigger than two right ones.

Thus from the conſideration of ourſelves, and what we infallibly find in our own conſtitutions, our reaſon leads us to the knowledge of this certain and evident truth, that *there is an eternal, moſt powerful, and knowing being*; and from this *idea* duly conſidered, will eaſily be deduced all thoſe other *attributes* we ought to aſcribe to this *eternal being*.

From what has been ſaid, it is plain, we have a more certain knowledge of the exiſtence of a *God*, than of any thing our ſenſes have not immediately diſcovered to us; nay, that we more certainly know that there is a *God*, than that there is any thing elſe without us.

It being then unavoidable for all rational creatures to conclude, that *ſomething has exiſted from eternity:* let us next ſee what *kind of thing* that muſt be. There are but two two ſorts of beings in the world, that man knows or conceives. *Firſt*, Such as are purely material, without ſenſe or perception, as the clippings of our beards, and parings of our nails. *Secondly*, Senſible perceiving beings; ſuch as we find ourſelves to be. Theſe two ſorts we ſhall hereafter call *cogitative* and *incogitative* beings: Which to our preſent purpoſe are better than *material* and *immaterial*.

If then there muſt be ſomething *eternal*, it is very obvious to reaſon, that it muſt neceſſarily be a *cogitative* being; becauſe it is as impoſſible to conceive that ever bare *incogitative* matter ſhould produce a *thinking* intelligent being, as that nothing ſhould of itſelf produce matter. Let us ſuppoſe any parcel of matter *eternal*, we ſhall find it in itſelf unable to produce any thing. Let us ſuppoſe its parts firmly at reſt together: If there were no other being in the world, muſt it not eternally remain ſo, a dead unactive lump? Is it poſſible to conceive it can add motion to itſelf, or produce any thing? *Matter* then by its own ſtrength cannot produce in itſelf ſo much as *motion*. The motion it has muſt alſo be from eternity, or elſe added to matter by ſome other being more powerful than matter. But let us ſuppoſe motion eternal too; yet matter, *incogitative* matter and motion, could never produce *thought: Knowledge* will ſtill be as far beyond the *power* of *motion* and *matter* to produce, as matter is beyond the power of nothing to produce. Divide *matter* into as minute parts as you will, vary the figure and motion of it as much as you pleaſe, it will operate no otherwiſe upon other bodies of proportionable bulk, than it did before this diviſion. The minuteſt particles of matter knock, impel, and reſiſt one another, juſt as the greater do; and that is all they can do. So that if we will ſuppoſe *nothing eternal, matter can never begin to be:* If we ſuppoſe *bare matter* without motion *eternal, motion can never begin to be:* If we ſuppoſe only matter and motion eternal, *thought can never begin to be*: For it is impoſſible to conceive that matter, either with or without motion, could have originally, in and from itſelf ſenſe, perception, and knowledge; as is evident from hence, that then ſenſe, perception and knowledge, muſt be a property eternally inſeparable from matter and every particle of it. Since therefore whatſoever is the firſt eternal being, muſt neceſſarily be *cogitative*; and whatſoever is firſt of all things, muſt neceſſarily contain in it, and actually have, at leaſt all the perfections that can ever after exiſt, it neceſſarily follows, that the *firſt eternal being cannot be matter*.

If therefore it be evident that ſomething neceſſarily muſt exiſt from eternity, it is alſo evident, that that *ſomething muſt neceſſarily be a cogitative being:* For it is as impoſſible that *incogitative matter* ſhould produce a *cogitative being*, as that nothing, or the negation of all being, ſhould produce a poſitive being or matter.

This diſcovery of the neceſſary exiſtence of an Eternal Mind,

mind does sufficiently lead us into the knowledge of *God*. For it will hence follow, that all other knowing beings that have a beginning must depend on him, and have no other ways of knowledge or extent of power than what he gives them; and therefore if he made those, he made also the less excellent pieces of this universe, all *inanimate bodies*, whereby his *omniscience, power*, and *providence*, will be established; and from thence all his other attributes necessarily follow.

Of our knowledge of the existence of other things.

THE knowledge of our own being we have by *intuition*: The existence of a *God*, *reason* clearly makes known to us. The *knowledge of the existence* of any other thing, we can have only by *sensation*; for there being no necessary connection *of real existence* with any *idea* a man hath in his memory; nor of any other existence, but that of *God*, with the existence of any particular man; no particular man can know the existence of any other being, but only when, by actually operating upon him, it makes itself be perceived by him. The having the *idea* of any thing in our mind, no more proves the existence of that thing, than the picture of a man evidences his being in the world, or the visions of a dream make thereby a true history. It is therefore the actual receiving of *ideas* from without, that gives us notice of the existence of other things, and makes us know that something doth exist at that time without us, which causes that *idea* in us, though perhaps we neither know nor consider how it does it; for it takes not from the *certainty* of our senses, and the *ideas* we receive by them, that we know not the manner wherein they are produced. This *notice* we have by our *senses* of the existing of things without us, though it be not altogether so certain as *intuition* and *demonstration*, deserves the name of knowledge, if we persuade ourselves that our faculties act and inform us right concerning the existence of those objects that affect them. But besides the assurance we have from our *senses* themselves, that they do not err in the information they give us of the existence of things without us, we have other concurrent reasons: As, *First*, It is plain those perceptions are produced in us by exterior causes affecting our senses, because those that want the *organs* of any *sense* never can have the *ideas* belonging to that sense produced in their minds. This is too evident to be doubted; and therefore we cannot but be assured, that they come in by the organs of that sense, and no other way.

Secondly, Because we find sometimes that we cannot avoid the having those *ideas* produced in our minds. When my eyes are shut, I can at pleasure recall to my mind the *ideas* of *light*, or the *sun*, which former sensations had lodged in my memory: But if I turn my eyes towards the *sun*, I cannot avoid the *ideas* which the *light* or the *sun* then produces in me. Which shews a manifest difference between those *ideas* laid up in the memory, and such as force themselves upon us, and we cannot avoid having. And therefore it must needs be some *exterior* cause, whose efficacy I cannot resist, that produces those *ideas* in my mind whether I will or no.

Besides, there is nobody who doth not perceive the difference in himself, between actually looking upon the *sun*, and contemplating the *idea* he has of it in his memory; and therefore he hath certain knowledge, that they are not both memory or fancy, but that actual seeing has a cause without.

Thirdly, Add to this, that many *ideas* are produced in us with pain, which we afterwards remember without the least offence. Thus the pain of *heat* or *cold*, when the *idea* of it is received in our minds, gives us no disturbance, which, when felt, was very troublesome; and we remember the pain of *hunger*, *thirst*, *head-ach*, &c. without any pain at all, which would either never disturb us, or else constantly do it, as often as we thought of it, were there nothing more but *ideas* floating in our minds, and appearances entertaining our fancies, without the real existence of things affecting us from abroad.

Fourthly, Our *senses* in many cases bear witness to the truth of each other's report concerning the existence of sensible things without us: he that doubts when he sees a *fire*, whether it be *real*, may, if he please, feel it too; and by the exquisite pain he will be convinced, that it is not a bare *idea* or *phantom*.

If after all this, any one will be so *sceptical*, as to distrust his senses, and to question the existence of all things, or our knowledge of any thing, let him consider that the certainty of things existing *in rerum natura*, when we have the testimony of our senses for it, is not only as great as our frame can attain to, but as our condition needs. For our *faculties* being not suited to the full extent of being, nor a clear comprehensive knowledge of all things, but to the preservation of us in whom they are, and accommodated to the use of life; they serve our purpose well enough, if they will but give us certain notice of those things that are convenient or inconvenient to us: For he that sees a *candle* burning, and has experimented the force of the flame, by putting his finger in it, will little doubt that this is something existing without him which does him harm, and puts him to pain; which is assurance enough; when no man requires greater certainty to govern his actions by, than what is as certain as his actions themselves: So that this evidence is as great as we can desire, being as certain to us as our pleasure or pain, that is, *happiness* or *misery*; beyond which we have no concernment either of knowing or being.

In fine, when our *senses* doth actually convey into our understandings any *idea*, we are assured that there is something at that time *really existing* without us. But this knowledge extends only as far as the present testimony of our senses, employed about particular objects, that do then affect them, and no farther. My seeing a *man* a minute since, is no certain argument of his present existence.

As when our *senses* are actually employed about any object, we know that it does exist; so by our memory we may be assured, that heretofore things that affected our *senses have existed*: And thus we have the knowledge of the past existence of several things, whereof our senses having informed us, our memories still retain the *ideas*; and of this we are past all doubt, so long as we remember well.

As to the *existence* of *spirits*, our having *ideas* of them does not make us know that any such things do exist without

without us, or that there are any *finite ſpirits*, or any other *ſpiritual beings* but the *eternal God*. We have ground from *revelation*, and ſeveral other reaſons, to believe with aſſurance, that there are ſuch creatures: But our ſenſes not being able to diſcover them, we want the means of knowing their particular exiſtence; for we can no more know that there are *finite ſpirits* really exiſting, by the *ideas* we have of ſuch beings, than by the *ideas* any one has of *fairies*, or *centaurs*, he can come to know, that things anſwering thoſe *ideas* do really exiſt.

Hence we may gather, that there are *two ſorts* of propoſitions: *One* concerning the exiſtence of any thing anſwerable to ſuch an *idea*, as that of an *elephant*, *phœnix*, *motion*, or *angel*, *viz.* whether ſuch a thing does any where exiſt: And this knowledge is only of *particulars*, and not to be had of any thing without us, but only of *God*, any other way than by our *ſenſes*.

Another ſort of propoſition is, wherein is expreſſed the agreement or diſagreement of our *abſtract ideas*, and their dependance one on another. And theſe may be *univerſal* and certain: ſo having the *idea* of *God* and my *ſelf*, of *fear* and *obedience*, I cannot but be ſure that *God is to be feared and obeyed by me:* and this propoſition will be certain concerning *man* in general, if I have made an *abſtract idea* of ſuch a *ſpecies*, whereof I am one particular. But ſuch a propoſition, how certain ſoever, proves not to me the exiſtence of men in the world; but will be true of all ſuch creatures, whenever they do exiſt: which *certainty* of ſuch general propoſitions, depends on the agreement or diſagreement diſcoverable in thoſe *abſtract ideas*. In the former caſe, our knowledge is the conſequence of the *exiſtence of things* producing *ideas* in our minds by our ſenſes: in the latter, the conſequences of the *ideas* that *are in our minds*, and producing theſe general propoſitions, many whereof are called *eternæ veritates:* and all of them indeed are ſo; not from being written all or any of them in the minds of all men, or that they were any of them propoſitions in any one's mind, till he, having got the *abſtract ideas*, joined or ſeparated them by affirmation or negation; but whereſoever we can ſuppoſe ſuch a creature as *man* is, endowed with ſuch faculties, and thereby furniſhed with ſuch *ideas* as we have, we muſt conclude he muſt needs, when he applies his thoughts to the conſideration of his *ideas*, know the truth of certain propoſitions that will ariſe from the agreement or diſagreement he will perceive in his own *ideas*. Such propoſitions being once made about *abſtract ideas*, ſo as to be true, they will, whenever they can be ſuppoſed to be made again, at any time paſt, or to come, by a mind having thoſe *ideas*, always be true: for names being ſuppoſed to ſtand perpetually for the ſame *ideas*, and the ſame *ideas* having immutably the ſame habitudes one to another, propoſitions concerning any *abſtract ideas* that are once true muſt needs be *eternal verities*.

Of judgment.

The *underſtanding faculties* being given to man, not barely for ſpeculation, but alſo for the conduct of his life, a man would be at a great loſs, if he had nothing to direct him but what has the certainty of true knowledge. He that will not *eat* till he has demonſtration that it will nouriſh him, nor *ſtir* till he is infallibly aſſured of ſucceſs in his buſineſs, will have little elſe to do but *ſit ſtill, and periſh*.

Therefore as *God* hath ſet ſome things in broad *daylight;* as he has given us ſome certain knowledge, though limited to a few things, in compariſon, (probably as a taſte of what *intellectual* creatures are capable of, to excite in us a deſire and endeavour after a better ſtate;) ſo in the greateſt part of our concernment, he has afforded us only the *twilight* of *probability*, ſuitable to that ſtate of *mediocrity* and *probationerſhip* he has been pleaſed to place us in here.

The faculty which *God* has given *man* to enlighten him, next to certain knowledge, is *judgment;* whereby the mind takes its *ideas* to agree or diſagree, without perceiving a demonſtrative evidence in the proofs. The mind exerciſes this judgment ſometimes out of *neceſſity*, where demonſtrative proofs and certain knowledge are not to be had; and ſometimes out of *lazineſs*, unſkilfulneſs, or haſte, even where they are to be had.

This faculty of the mind, when it is exerciſed immediately about things, is called *judgment*; when about truths delivered in words, is moſt commonly called *aſſent* or *diſſent*. Thus the mind has *two faculties* converſant about truth and falſehood: Firſt, *Knowledge*; whereby it certainly perceives, and is undoubtedly ſatisfied of the agreement or diſagreement of any ideas. Secondly, *Judgment*, which is the putting *ideas* together, or ſeparating them from one another in the mind, when their certain agreement or diſagreement is not *perceived*, but preſumed to be be ſo. And if it ſo unites or ſeparates them as in reality things are, it is *right judgment*.

Of probability.

Probability is nothing but the appearance of the agreement or diſagreement of two *ideas*, by the intervention of proofs, whoſe connection is not conſtant and immutable, or is not perceived to be ſo; but is or appears for the moſt part to be ſo; and is enough to induce the mind to judge the propoſition to be *true* or *falſe*, rather than the contrary.

Of *probability* there are degrees, from the neighbourhood of *certainty* and *demonſtration*, quite down to *improbability* and *unlikelineſs*, even to the confines of *impoſſibility:* And alſo degrees of *aſſent* from certain knowledge, and what is next it, full aſſurance and confidence, quite down to conjecture, doubt, diſtruſt, and diſbelief.

That propoſition then is *probable*, for which there are arguments or proofs to make it paſs or be received for *true:* The entertainment the mind gives to this ſort of propoſitions, is called *belief*, *aſſent*, or *opinion*. *Probability* then being to ſupply the defect of our knowledge, is always converſant about propoſitions whereof we have no *certainty*, but only ſome *inducements* to receive them for true. The *grounds* of it are, in ſhort, *theſe two* following.

Firſt, The *conformity* of any thing with our own knowledge, experience, or obſervation.

Secondly, The *teſtimony* of others, vouching their obſervation and experience. In the *teſtimony* of others is

to

to be considered, *First*, The number; *Secondly*, The integrity; *Thirdly*, The skill of the witnesses; *Fourthly*, The design of the author, if it be a testimony cited out of a book; *Fifthly*, The consistency of the parts and circumstances of the relation; *Sixthly*, Contrary testimonies.

The mind, before it rationally *assents* or *dissents* to any probable proposition, ought to examine all the grounds of *probability*, and see how they make, more or less, for or against it; and upon a due balancing of the whole, reject or receive it, with a more or less firm *assent*, according to the preponderancy of the greater *grounds* of *probability* on one side, or the other.

Of the degrees of assent.

The *grounds of probability*, laid down in the foregoing section, as they are the foundations on which our *assent* is built, so are they also the measure whereby its several *degrees* are (or ought to be) regulated. Only we are to take notice, that no grounds of probability operate any farther on the mind, which searches after truth, and endeavours to judge right, than they appear, at least, in the first judgment or search that the mind makes. It is indeed in many cases impossible, and in most very hard, even for those who have admirable memories, to retain all the proofs which, upon a due examination, made them embrace that side of the question. It suffices, that they have once, with care and fairness, sifted the matter as far as they could; and having once found on which side the *probability* appeared to them, they lay up the conclusion in their memories, as a *truth* they have discovered; and for the future remain satisfied with the testimony of their memories, that this is the opinion, that, by the proofs they have once seen of it, deserves such a *degree* of their *assent* as they afford it.

It is unavoidable then that the memory be relied on in this case, and that men be persuaded of several *opinions*, whereof the proofs are not actually in their thoughts, nay, which perhaps they are not able actually to recall: Without this the greatest part of men must be either *sceptics*, or change every moment, when any one offers them arguments which for want of memory, they are not presently able to answer.

It must be owned, that mens sticking to past jugments, is often the cause of great *obstinacy* in error and mistake: But the fault is not that they rely on their memories for what they have before well judged, but because they judged before they had well examined. Who almost is there that hath the leisure, patience, and means, to collect together all the proofs concerning most of the opinions he has, so as safely to conclude, that he has a clear and full view, and that there is no more to be alledged for his better information? And yet we are forced to determine ourselves on one side, or other: The conduct of our lives, and the management of our great concerns, will not bear delay: For those depend, for the most part, on the determination of our judgment in points, wherein we are not capable of certain knowledge, and wherein it is necessary for us to embrace one side or the other.

The propositions we receive upon inducements of *probability*, are of *two sorts*: *First*, Concerning some particular existence, or matter of *fact*, which falling under our observation, is capable of *human testimony*: *Secondly*, Concerning things which, being beyond the discovery of our *senses*, are not capable of human testimony.

Concerning the first of these, *viz. Particular matter of fact.*

First, Where any particular thing, consonant to the constant observation of ourselves, and others, in the like case, comes attested with the concurrent reports of all that mention it, we receive it as easily, and build as firmly upon it, as if it were certain knowledge. Thus, if all *Englishmen*, who have occasion to mention it, should report, that it *froze* in *England* last winter, or the like, a man would as little doubt of it, as that *seven and four are eleven*.

The *first* and *highest* degree of *probability* then is, when the general consent of all men, in all ages, as far as can be known, concurs with a man's own constant experience in the like cases, to confirm the truth of any particular matter of fact, attested by fair witnesses: Such are the stated *constitutions* and *properties* of bodies, and the regular proceedings of *causes* and *effects* in the ordinary course of *nature*. This we call an *argument* from the nature of things themselves: For what we and others always observe to be after the same manner, we conclude with reason to be the effects of steady and regular *causes*, though they come not within the reach of our knowledge; as that fire warmed a man, or made *lead fluid*; that *iron* sunk in water, swam in quicksilver. A relation affirming any such thing to have been, or a predication that it will happen again in the same manner, is received without doubt or hesitation; and our *belief* thus grounded, rises to *assurance*.

Secondly, The next degree of *probability*, is when by my own experience, and the agreement of all others that mention it, a *thing* is found to be for the most part so; and that the particular instance of it is attested by many and undoubted *witnesses*. Thus *history* giving us such an account of men in all ages, and my own experience confirming it, that most men prefer their own private advantage to the public; if all historians that write of *Tiberius*, say that he did so, it is extremely probable: And in this case, our *assent* rises to a degree which we may call *confidence*.

Thirdly, In matters happening indifferently, as that a *bird* should fly this or that way; when any particular matter of fact comes attested by the concurrent testimony of unsuspected *witnesses*, there our *assent* is also unavoidable. Thus, that there is in *Italy* such a city as *Rome*; that about one thousand and seven hundred years ago there lived such a man in it as *Julius Cæsar*, &c. a man can as little doubt of this, and the like, as he does of the being and actions of his own acquaintance, whereof he himself is a witness.

Probability, on these grounds, carries so much evidence with it, that it leaves us as little liberty to believe or disbelieve, as demonstration does, whether we will know or be ignorant. But the difficulty is, when testimonies contradict common experience, and the reports of witnesses clash with the ordinary course of nature, or with one another; here diligence, attention, and exactness, is required

quired to form a *right judgment*, and to proportion the *assent* to the evidence and *probability* of the thing, which rises and falls according as the two foundations of credibility favour or contradict it. These are liable to such variety of contrary observations, circumstances, reports, tempers, designs, over-sight, *&c.* of reporters, that it is impossible to reduce to precise rules the various degrees wherein men give their *assent*. This in general may be said, that as the *proofs*, upon due examination, shall to any one appear in a greater or less degree to preponderate on either side, so they are fitted to produce in the mind such different entertainments, as are called *belief*, *conjecture*, *guess*, *doubt*, *wavering*, *distrust*, *disbelief*, &c.

It is a *rule* generally approved, that any testimony, the farther off it is removed from the original truth, the less force it has: And in *traditional* truths, each remove weakens the force of the *proof*. There is a *rule* quite contrary to this, advanced by some men, who look on *opinions* to gain force by growing *older*. Upon this ground, propositions evidently false or doubtful in their first beginning, come by an inverted *rule* of *probability* to pass for *authentic* truths; and those which deserved little credit from the mouths of their first relators, are thought to grow *venerable* by age, and are urged as undeniable.

But certain it is, that no *probability can rise above its first original*. What has no other evidence than the single testimony of *one witness*, must stand or fall by his *only* testimony, though afterwards cited by hundreds of others; and is so far from receiving any strength thereby, that it becomes the weaker; because passion, interest, inadvertency, mistake of his meaning, and a thousand odd reasons, which capricious mens minds are acted by, may make one man quote another's words or meaning wrong. This is certain, that what in one age was affirmed upon slight grounds, can never after come to be more valid in future ages by being often repeated.

The second sort of probability, is concerning things not falling under the reach of our senses, and therefore not capable of testimony: And such are,

1st, The existence, nature, and operations of *finite immaterial* beings without us, as *spirits*, *angels*, &c. or the existence of *material* beings such as, for their smallness or remoteness, our *senses* cannot take notice of; as whether there be any *plants*, *animals*, &c. in the *planets*, and other mansions of the vast universe.

2dly, Concerning the manner of operation in most parts of the works of *nature*; wherein though we see the sensible *effects*, yet their causes are unknown, and we perceive not the ways and manner how they are produced. We see *animals* are generated, nourished, and move; the *loadstone* draws *iron*, &c. But the causes that operate, and the manner they are produced in, we can only guess, and probably conjecture. In these matters *analogy* is the only help we have; and it is from that alone we draw all our grounds of *probability*. Thus observing, that the bare rubbing of two bodies violently upon one another, produces *heat*, and very often *fire*, we have reason to think, that what we call *heat* and *fire* consists in a certain violent agitation of the imperceptible minute parts of the burning matter. This sort of *probability*, which is the best conduct of rational experiments, and the rise of *hypotheses* has also its use and influence. And a wary reasoning from *analogy* leads us often into the discovery of *truths* and useful *deductions*, which would otherwise lie concealed.

Though the common experience, and the ordinary course of things, have a mighty influence on the minds of men, to make them give or refuse credit to any thing proposed to their belief; yet there is one case wherein the strangeness of the fact lessens not the *assent* to a fair testimony given of it. For where such supernatural *events* are suitable to ends aimed at by Him who has the power to change the course of nature, there, under such circumstances, they may be the fitter to procure belief, by how much the more they are beyond or contrary to ordinary observation. This is the proper case of *miracles*; which, well attested, do not only find credit themselves, but give it also to other *truths*.

There are propositions that challenge the highest degree of our *assent* upon bare testimony, whether the thing proposed agree or disagree with common experience and the ordinary course of things or no: The reason whereof is, because the testimony is of such *an one* as cannot deceive nor be deceived; and that is *God* himself. This carries with it certainty beyond doubt, evidence beyond exception. This is called by a peculiar name, *revelation*, and our *assent* to it, *faith*, which has as much certainty in it as our knowledge itself; and we may as well doubt of our own *being*, as we can whether any *revelation* from *God* be *true*. So that *faith* is a settled and sure principle of *assent* and *assurance*, and leaves no manner of room for doubt or hesitation; only we must be sure, that it be a divine *revelation*, and that we understand it right, else we shall expose ourselves to all the extravagancy of *enthusiasm*, and all the error of wrong principles, if we have *faith* and *assurance* in what is not *divine revelation*.

Of reason.

The word *reason*, in *English*, has different significations. Sometimes it is taken for *true* and *clear principles*; sometimes for *clear* and *fair deductions* from those principles; sometimes for the *cause*, and particularly for the *final cause*: But the consideration we shall have of it here, is as it stands for a *faculty* whereby *man* is supposed to be distinguished from *beasts*, and wherein it is evident he much surpasses them.

Reason is necessary, both for the enlargement of our knowledge, and regulating our assent; for it hath to do both in knowledge and opinion, and is necessary and assisting to all our other intellectual faculties; and indeed contains *two* of them, *viz.* first, *Sagacity*, whereby it finds intermediate *ideas*; secondly, *Illation*, whereby it so orders and disposes of them, as to discover what connection there is in each link of the chain, whereby the extremes are held together, and thereby, as it were, to draw into view the truth sought for; which is that we call *illation*, or *inference*; and consists in nothing but the perception of the connection there is between the *ideas* in each step of the deduction; whereby the mind comes to see either the certain agreement or disagreement of any two

two *ideas*, as in *demonſtration*, in which it arrives at knowledge; or their probable connection, on which it gives or with-holds its *aſſent*, as in *opinion*.

Senſe and *intuition* reach but a little way: The greateſt part of our knowledge depends upon deductions and intermediate *ideas*. In thoſe caſes where we muſt take propoſitions for true, without being certain of their being ſo, we have need to find out, examine, and compare the grounds of their *probability*: In both caſes, the faculty which finds out the means, and rightly applies them to diſcover certainty in the one, and probability in the other, is that which we call *reaſon*: So that in reaſon we may conſider theſe *four* degrees; *firſt*, The diſcovering and finding out of proofs; *ſecondly*, The regular and methodical diſpoſition of them, and laying them in ſuch order as their connection may be plainly perceived; *thirdly*, The perceiving their connection; *fourthly*, The making a right concluſion.

There is one thing more which deſerves to be conſidered concerning *reaſon*; and that is, whether *ſyllogiſm*, as is generally thought, be the proper inſtrument of it; and the uſefulleſt way of exerciſing this faculty. The cauſes to doubt of it, are theſe:

Firſt, Becauſe *ſyllogiſm* ſerves our *reaſon* but in one only of the forementioned parts of it; and that is, to ſhew the connection of the proofs of any one inſtance, and no more: But in this it is of no great uſe, ſince the mind can perceive ſuch connection, where it really is, as eaſily, nay perhaps better, without it. We may obſerve, that there are many men that reaſon exceeding clear and rightly, who know not how to make a *ſyllogiſm*: And ſcarce any one make *ſyllogiſms* in reaſoning within himſelf. Indeed, ſometimes they may ſerve to diſcover a fallacy, hid in a *rhetorical* flouriſh; or by ſtripping an abſurdity of the cover of wit and good language, ſhew it in its naked deformity: But the weakneſs or fallacy of ſuch a looſe diſcourſe it ſhews, by the artificial form it is put into, only to thoſe who have throughly ſtudied *mode* and *figure*, and have ſo examined the many ways that three propoſitions may be put together, as to know which of them does certainly conclude right, and which not, and upon what grounds it is that they do ſo: But they who have not ſo far looked into thoſe forms, are not ſure, by virtue of *ſyllogiſm*, that the concluſion certainly follows from the premiſſes; the mind is not taught to reaſon by theſe *rules*; it has a native faculty to perceive the coherence or incoherence of its *ideas*, and can range them right without any ſuch perplexing *repetitions*.

And to ſhew the weakneſs of an argument, there needs no more but to ſtrip it of the ſuperfluous *ideas*, which, blended and confounded with thoſe on which the inference depends, ſeem to ſhew a connection where there is none, or at leaſt do hinder the diſcovery of the want of it; and then to lay the naked *ideas*, on which the force of the argumentation depends, in their due order; in which poſition the mind, taking a view of them, ſees what connection they have, and ſo is able to judge of the inference without any need of ſyllogiſm at all.

Secondly, Becauſe ſyllogiſms are not leſs liable to fallacies than the plainer ways of argumentation. And for this we appeal to common obſervation, which has always found theſe artificial methods of reaſoning more adapted to catch and entangle the mind, than to inſtruct and inform the underſtanding. And if it be certain that fallacy can be couched in ſyllogiſms, as it cannot be denied, it muſt be ſomething elſe, and not ſyllogiſm, that muſt diſcover them: But if men ſkilled in and uſed to ſyllogiſms, find them aſſiſting to their reaſon in the diſcovery of truth, we think they ought to make uſe of them. All that we aim at is, that they ſhould not aſcribe more to theſe forms than belongs to them; and think that men have no uſe, or not ſo full a uſe, of their reaſoning faculty without them.

But however it be in knowledge, it is of far leſs, or no uſe at all in *probabilities*: For the *aſſent* there being to be determined by the preponderancy, after a due weighing of all the proofs on both ſides, nothing is ſo unfit to aſſiſt the mind in that as *ſyllogiſm*; which running away with one aſſumed *probability*, purſues that till it has led the mind quite out of ſight of the thing under conſideration.

But let it help us (as perhaps may be ſaid) *in convincing men of their errors or miſtakes*: yet ſtill it fails our reaſon in that part, which if not its higheſt perfection, is yet certainly its hardeſt taſk, and that which we moſt need its help in; and that is, *the finding out of proofs, and making new diſcoveries*. This way of reaſoning diſcovers no new proofs, but is the art of marſhalling and ranging the old ones we have already. A man knows firſt, and then he is able to prove *ſyllogiſtically*; ſo that *ſyllogiſm* comes after knowledge; and then a man has little or no need of it. But it is chiefly by the finding out thoſe *ideas* that ſhew the connection of diſtant ones, that our ſtock of knowledge is increaſed, and that uſeful arts and ſciences are advanced.

Reaſon, though of a very large extent, fails us in ſeveral inſtances; as, *firſt*, Where our *ideas* fail. *Secondly*, It is often at a loſs, becauſe of the obſcurity, confuſion, or imperfection of the *ideas* it is employed about. Thus having no perfect *idea* of the leaſt extenſion of *matter*, or of *infinity*, we are at a loſs about the diviſibility of *matter*. *Thirdly*, Our *reaſon* is often at a ſtand, becauſe it perceives not thoſe *ideas*, which would ſerve to ſhew the certain or probable agreement or diſagreement of any two other *ideas*. *Fourthly*, Our *reaſon* is often engaged in abſurdities and difficulties, by proceeding upon falſe principles, which being followed, lead men into contradictions to themſelves, and inconſiſtency in their own thoughts. *Fifthly*, Dubious words, and uncertain ſigns, often puzzle mens *reaſon*, and bring them to a nonplus.

Though the deducing one propoſition from another, be a great part of reaſon, and that which it is uſually employed about; yet the principal act of ratiocination, is the finding the agreement or diſagreement of two *ideas* one with another, by the intervention of a third; as a man, by a yard, finds two houſes to be of the ſame length, which could not be brought together to meaſure their equality by *juxta-poſition*: Words have their conſequences as the ſigns of ſuch *ideas*; and things agree or diſagree, as really they are; but we obſerve it only by our *ideas*.

In

In reaſoning, men ordinarily uſe *four* ſorts of *arguments*.

The *firſt* is to alledge the opinions of men, whoſe parts, learning, eminency, power, or ſome other cauſe, has gained a name, and ſettled their reputation in the common eſteem with ſome kind of authority: This may be called *argumentum ad verecundiam*.

Secondly, Another way is, to require the adverſary to admit what they alledge as a proof, or to aſſign a better: This is called *argumentum ad ignorantiam*.

A *third* way, is to preſs a man with conſequences drawn from his own priciples or conceſſions: This is known under the name of *argumentum ad hominem*.

Fourthly, The uſing of proofs drawn from any of the foundations of knowledge or probability: This is called *argumentum ad judicium*. This alone, of all the four, brings true inſtruction with it, and advances us in our way to knowledge: For, *firſt*, It argues not another man's opinion to be righ', becauſe I, out of reſpect, or any other conſideration but that of conviction, will not contradict him. *Secondly*, It proves not another man to be in the right way, nor that I ought to take the ſame with him, becauſe I know not a better. *Thirdly*, Nor does it follow, that another man is in the right way, becauſe he has ſhewn me that I am in the wrong: This may diſpoſe me, perhaps, for the reception of truth, but helps me not to it: that muſt come from *proofs and arguments*, and light ariſing from the nature of things themſelves; not from my ſhame-facedneſs, ignorance, or error.

By what has been ſaid of *reaſon*, we may be able to make ſome gueſs at the diſtinction of things into thoſe that are according to, above, and contrary to *reaſon*. *According to reaſon*, are ſuch propoſitions whoſe truth we can diſcover by examining and tracing thoſe *ideas* we have from *ſenſation* and *reflection*, and by natural deduction find to be true or probable. *Above reaſon*, are ſuch propoſitions, whoſe *truth* or *probability* we cannot by *reaſon* derive from thoſe principles. *Contrary to reaſon*, are ſuch propoſitions as are inconſiſtent with, or irreconcileable to our clear and diſtinct *ideas*. Thus the *exiſtence of one God*, is according to *reaſon*; the *exiſtence of more than one God*, contrary to *reaſon*; the *reſurrection of the body* after death, above *reaſon*. *Above reaſon*, may be alſo taken in a double ſenſe, *viz*. *Above probability*, or, *above certainty*: In that large ſenſe alſo, *contrary to reaſon* is ſometimes taken.

There is another uſe of the word *reaſon*, wherein it is oppoſed to *faith*; which, though authoriſed by common uſe, yet is it in itſelf a very improper way of ſpeaking; for *faith* is nothing but a firm *aſſent* of the mind; which, if it be regulated as is our duty, cannot be afforded to any thing but upon good *reaſon*, and ſo cannot be oppoſite to it: He that believes without having any reaſon for believing, may be in love with his own fancies; but neither ſeeks *truth* as he ought, nor pays the obedience due to his Maker, who would have him uſe thoſe diſcerning faculties he has given him, to keep him out of miſtake and error.

METAPLASMUS, in grammar, a tranſmutation or change made in a word, by adding, retrenching, or altering a letter or ſyllable thereof.

METASTASIS, in medicine, a tranſpoſition or ſettlement of ſome humour or diſeaſe on ſome other part; and ſometimes it ſignifies ſuch an alteration of a diſeaſe as is ſucceeded by a ſolution.

METATARSUS, in anatomy. See ANATOMY, p. 187.

METATHESIS, in grammar, a ſpecies of the metaplaſmus; being a figure whereby the letters or ſyllables of a word are tranſpoſed, or ſhifted out of their uſual ſituation, as piſtris for priſtis.

METEMPSYCHOSIS, the doctrine of tranſmigration, which ſuppoſes that human ſouls, upon leaving the body, become the ſouls of ſuch kind of brutes as they moſt reſemble in their manners.

This was the doctrine of Pythagoras and his followers; who, held that the ſouls of vicious men were impriſoned in the bodies of miſerable beaſts, there to do penance for ſeveral ages, at the expiration whereof they returned again to animate men; but if they had lived virtuouſly, ſome happier brute, or even a human creature, was to be their lot. What led Pythagoras into this opinion was the perſuaſion he had that the ſoul was not of a periſhable nature; whence he concluded, that it muſt move into ſome other body upon its abandoning this. Lucan thinks this doctrine was contrived to mitigate the apprehenſion of death, by perſuading men that they only changed their lodgings, and ceaſed to live only to begin a new life.

METEMTOSIS, a term in chronology, expreſſing the ſolar equation, neceſſary to prevent the new moon from happening a day too late; by which it is oppoſed to proemptoſis, which ſignifies the lunar equation neceſſary to prevent the new moon from happening a day too ſoon.

METEOR, in phyſiology, an imperfect, changeable, and mixt body, or the reſemblance of a body appearing in the atmoſphere, and formed by the action of the heavenly bodies, out of the common elements.

Meteors are of three kinds; fiery, airy, and watery. Fiery meteors conſiſt of a fat ſulphureous ſmoke ſet on fire; ſuch as falling ſtars, draco volans, the ignis fatuus, and other phænomena, appearing in the air. Airy meteors conſiſt of flatulent and ſpirituous exhalations, ſuch as winds, &c. Watery meteors are compoſed of vapours, or watery particles, variouſly modified by heat and cold, ſuch as clouds, rain, hail, ſnow and dew.

METHEGLIN, a drink prepared of honey, one of the moſt pleaſant and general drinks the northern parts of Europe afford. It is, according to Bailey, made as follows: Put as much new honey naturally running from the comb, into ſpring water, as that, when the honey is throughly diſſolved, an egg will not ſink to the bottom, but be juſt ſuſpended in it. Then boil the liquor for

for an hour or more, till ſuch time as the egg ſwim above the liquor; then take it off the fire, and let it cool. When very cool, next morning, it may be barrelled up; and adding to it half an ounce of ginger, as much of cloves, as much of mace, and a quarter of an ounce of cinnamon, all groſly pounded, a ſpoonful of yeaſt may be added alſo at the bung to increaſe its fermentation. When it has done working, it may be cloſely ſtopped up; and after it has ſtood a month, it may be drawn off into bottles.

METHOD, the arrangement of our ideas in ſuch a regular order, that their mutual connection and dependence may be readily comprehended.

METHODISTS, a name at firſt given to a ſociety of religious young men at Oxford, and now applied to all thoſe who adhere to the doctrine of the church of England as taught by Whitefield, Weſley, *&c.* They are ſaid to be, in general, plain well-meaning people, who do not diſſent from the eſtabliſhed church; but profeſs to live with great purity, according to her articles. At their firſt appearance their teachers were charged, in the heat of their zeal, with ſeveral irregularities, and many expreſſions in their preaching which were not altogether unexceptionable; but as the civil government, with a moderation and wiſdom peculiar to the preſent time, thought fit to overlook their behaviour, they have ſince honeſtly acknowledged wherein they were miſtaken; and, in conſequence of the perfect liberty of conſcience they enjoy, have ſuſided into a more regular and peaceable conduct, agreeable to the genuine ſpirit of Chriſtianity.

METHODISTS, *Methodici*, is alſo an appellation given to a ſect of ancient phyſicians, who reduced the whole healing art to a few common principles or apearances.

METONYMY, in rhetoric, is a trope in which one name is put for another, on account of the near relation there is between them. By this trope any of the moſt ſignificant circumſtances of a thing are put for the thing itſelf. The metonymy is uſed with moſt advantage in the following caſes. 1. When the narration ſtands for the action, and what the poet or hiſtorian deſcribes he is ſaid to do; which is a lively manner of expreſſion, exceeding the common, as much as action goes beyond deſcription, or life excels painting. 2. When the name of any relation is put for the duty it requires, and the benevolence and tenderneſs that may be expected from it. Thus Anacreon ſays, that through money there is no longer any ſuch thing as brethren or parents in the world. 3. When the word which is uſed for a proper name, is either taken from the perſon's country, family, profeſſion, perſonal circumſtance, or reſemblance to ſome other: thus, as Sardanapalus was a monſter of debauchery, and Nero of cruelty, to call a very debauched perſon a Sardalapalus, and a cruel one Nero, brands them much deeper than to call one debauched, and the other cruel.

METOPE, in architecture, is the interval, or ſquare ſpace between the triglyphs of the doric frieze, which among the ancients uſed to be painted or adorned with carved work, repreſenting the heads of oxen, or utenſils uſed in ſacrifices.

METOPOSCOPY, the pretended art of knowing a perſon's diſpoſition and manners, by viewing the traces and lines in the face.

METRE, in poetry, a ſyſtem of feet of a juſt length.

The different metres in poetry, are the different manners of ordering and combining the quantities, or the long and ſhort ſyllables; thus hexameter, pentameter, iambic, ſapphic verſes, *&c.* conſiſt of different metres, or meaſures.

In Engliſh verſes, the metres are extremely various and arbitrary, every poet being at liberty to introduce any new form that he pleaſes. The moſt uſual are the heroic, generally conſiſting of five long and five ſhort ſyllables, and verſes of four feet, and of three feet and a cæſura or ſingle ſyllable.

METRETES, an ancient meaſure of capacity, containing a little more than nine gallons.

METROPOLIS, the capital or principal city of a country or province.

The term metropolis is alſo applied to archiepiſcopal churches, and ſometimes to the principal or mother church of a city.

METZ, a city of Germany, in the duchy of Lorrain, capital of the biſhoprick of Metz, ſituated thirty miles north of Nancy.

MEXICO, the metropolis of New Spain at preſent, and formerly of the empire of Mexico, ſituated in W. long. 103°. N. lat. 20°.

This province of New Spain in America is now divided into Old and New Mexico.

Old MEXICO, ſituated between 83 and 116 degrees of W. long and between 8 and 28 degrees N. lat. is bounded by New Mexico, or Granada, on the north; by the gulph of Mexico, on the north-eaſt; by Terra-firma, on the ſouth-eaſt; and by the Pacific Ocean, on the ſouth-weſt.

New MEXICO, including California, ſituated between 100 and 140 degrees of W. long. and between the Tropic of Cancer and 48 degrees of N. lat. is bounded by unknown lands on the north, by Florida on the eaſt, by Old Mexico on the ſouth, and by the Pacific Ocean on the weſt.

MEZZOTINTO, a particular manner of repreſenting figures on copper, ſo as to form prints in imitation of painting in Indian ink.

The manner of making mezzotintos is very different from all other kinds of engraving and etching, ſince inſtead of forming the figures with lines and ſcratches made with the point of a graver, or by means of aquafortis, they are wholly formed by ſcraping and burniſhing. Mezzotintos are made in the following manner: take a well-poliſhed copper-plate, and beginning at the corner, rake or furrow the ſurface all over with a knife or inſtrument made for the purpoſe, firſt one way, and then the other, till the whole is of a regular roughneſs, without the laſt ſmooth part to be ſeen; in which ſtate, if a paper was to be worked off from it at the copper-plate preſs, it would be all over black. When this is done, the plate is rubbed over with charcoal, black chalk, or black lead, and then the deſign is drawn with white chalk; after which the cut-lines are traced out,

out, and the plate finiſhed by ſcraping off the roughneſs, ſo as to leave the figure on the plate. The outlines and deepeſt ſhades are not ſcraped at all, the next ſhades are ſcraped but little, the next more, and ſo on, till the ſhades gradually falling off, leave the paper white, in which the places the plate is neatly burniſhed.

By an artful diſpoſition of the ſhades, and different parts of a figure on different plates, mezzotintos have been printed in colours, ſo as nearly to repreſent very beautiful paintings.

MIASMA, among phyſicians, denotes the contagious effluvia of peſtilential diſeaſes, whereby they are communicated to people at a diſtance.

MICA, GLIMMER, in natural hiſtory, a genus of talcs.

The bright appearance of the gold and ſilver glimmers, has led ſome to imagine they were gold and ſilver ores; but the truth is, they contain not the leaſt grain of either of theſe metals, being mere talc, accidentally coloured. See TALC.

MICAH, or the *book of* MICAH, a canonical book of the Old Teſtament, written by the prophet Micah, who is the ſeventh of the twelve leſſer prophets. He is cited by Jeremiah, and propheſied in the days of Jotham, Ahaz, and Hezekiah. He cenſures the reigning vices of Jeruſalem and Samaria, and denounces the judgments of God againſt both kingdoms. He likewiſe foretells the confuſion of the enemies of the Jews, the coming of the Meſſiah, and the glorious ſucceſs of his church.

MICHAELMAS, or *feaſt of St* MICHAEL *and all angels*, a feſtival of the Chriſtian church, obſerved on the 29th of September.

MICHELIA, in botany, a genus of the polyandria polygynia claſs. The calix conſiſts of eight ſegments, and the corrolla of eight petals; and the berries contain many ſeeds. There is but one ſpecies, a native of India.

MICROCOS, in botany, a genus of the polyandria monogynia claſs. The calix conſiſts of five leaves, and the corolla of five petals. There are two ſpecies, both natives of India.

MICROCOSM, a Greek term, ſignifying the little world; uſed by ſome for man, as being ſuppoſed an epitome of the univerſe or great world.

MICROGRAPHY, the deſcription of objects too minute to be viewed without the aſſiſtance of a microſcope. See MICROSCOPE.

MICROMETER, a machine, which, by means of a ſcrew, ſerves to meaſure extremely ſmall diſtances to a great degree of accuracy.

MICROPUS, in botany, a genus of the ſyngeneſia polygamia ſegregata claſs. The receptacle is paleaceous; it has no pappus; and the corrolla have no radii. There are two ſpecies, none of them natives of Britain.

MICROSCOPE, an optical inſtrument, by means whereof very minute objects are repreſented. See OPTICS.

MIDAS-EAR-SHELL, the ſmooth ovato-oblong buccinum, with an oblong and very narrow mouth. It conſiſts of ſix volutions, but the lower one alone makes up almoſt the whole ſhell.

MID-HEAVEN, the point of the ecliptic that culminates, or in which it cuts the meridian,

MIDDLEBURG, the capital city of Zealand, one of the United Provinces, ſituated in the iſland of Welcherin, twenty-ſix miles north-eaſt of Bruges.

MIDDLESEX, a county of England, in which London, the metropolis, ſtands. It is twenty four miles long, and only fourteen broad; and is bounded by Hertfordſhire, on the north; by the river Lea, which divides it from Eſſex, on the eaſt; by the river Thames, which ſeparates it from Surry, on the ſouth; and by the brook Coln, which divides it from Buckinghamſhire, on the weſt.

MIDHURST, a borough-town of Suſſex, ten miles north of Chicheſter; which ſends two members to parliament.

MIDWIFERY.

MIDWIFERY is the art of aſſiſting nature in bringing forth a perfect fœtus, or child, from the womb of the mother.

The knowledge of this art depends greatly on an intimate acquaintance with the anatomy of the parts of generation in women, both internal and external. But, as thoſe have already been fully deſcribed under the article ANATOMY, we muſt refer to the different parts of that ſcience upon which the knowledge of midwifery depends.

For the BONES of the PELVIS, ſee ANATOMY, p. 171, &c.

For the PARTS of GENERATION in FEMALES, both external and internal, ſee ANATOMY, p. 274, &c.

For the different theories of CONCEPTION, ſee GENERATION.

Of the increaſe of the UTERUS *after conception.*

IT is ſuppoſed, that the ovum ſwims in a fluid, which it abſorbs ſo as to increaſe gradually in magnitude, till it comes in contact with all the inner ſurface of the fundus uteri; and this being diſtended in proportion to the augmentation of its contents, the upper part of the neck begins alſo to be ſtretched.

About the third month of geſtation, the ovum in bigneſs equals a gooſe egg; and then nearly one fourth of the neck, at its upper part, is diſtended equal with the fundus. At the fifth month, the fundus is increaſed to a much greater magnitude, and riſes upwards to the middle ſpace betwixt the upper part of the pubes and the navel; and at that period, one half of the neck is extended. At the ſeventh month, the fundus reaches as high as the navel; at the eighth month, it is advanced midway between the navel and *ſcrobiculus cordis*; and in the ninth month, is raiſed quite up to this laſt mentioned part, the neck of the womb being then altogether diſtended. See Plate CXI. fig. 1, 2, 3.

FIG. 1. Gives a front-view of the uterus *in ſitu* ſuſpended in the vagina; the anterior parts of oſſa iſchium, with the oſſa pubis, pudenda, perinæum, and anus, being removed in order to ſhew the internal parts.

A, The laſt vertebra of the loins.

BB, The oſſa ilium.

CC, The acetabula.

DD, The inferior and poſterior parts of the oſſa iſchium.

E, The part covering the extremity of the coccyx.

F, The inferior part of the rectum.

GG, The vagina cut open longitudinally, and ſtretched on each ſide of the collum uteri, to ſhew in what manner the uterus is ſuſpended in the ſame.

HH, Part of the veſica urinaria ſtretched on each ſide of the vagina, and inferior part of the fundus uteri.

I, The collum uteri.

K, The fundus uteri.

LL, The tubi Fallopiani and fimbriæ.

MM, The ovaria.

NN, The ligamenta lata and rotunda.

OO, The ſuperior part of the rectum.

FIG. 2. Gives a front-view of the uterus in the beginning of the firſt month of pregnancy; the anterior part being removed that the embryo might appear through the amnios, the chorion being diſſected off.

A, The fundus uteri.

B, The collum uteri, with a view of the rugous canal that leads to the cavity of the fundus.

C, The os uteri.

FIG. 3. In the ſame view and ſection of the parts as in fig. 1. ſhews the uterus as it appears in the ſecond or third month of pregnancy.

F, The anus.

G, The vagina, with its plicæ.

HH, The poſterior and inferior part of the urinary bladder extended on each ſide; the anterior and ſuperior part being removed.

II, The mouth and neck of the womb, as raiſed up when examining the ſame by the touch, with one of the fingers in the vagina.

KK, The uterus as ſtretched in the ſecond or third month, containing the embryo, with the placenta adhering to the fundus.

Now that the whole ſubſtance of the uterus is ſtretched, the neck and os internum, which were at firſt the ſtrongeſt, become the weakeſt part of the womb, and the ſtretching force being ſtill continued by the increaſe of the fœtus and ſecundines, which are extended by the incloſed waters in a globular form, the os uteri begins gradually to give way. In the beginning of its dilatation, the nervous fibres in this place, being more ſenſible than any other part of the uterus, are irritated, and yield an uneaſy ſenſation; to alleviate which, the woman ſqueezes her uterus, by contracting the abdominal muſcles, and at the ſame time filling the lungs with air, by which the diaphragm is kept down; the pain being rather increaſed than abated by this ſtraining, is communicated to all the neighbouring parts, to which the ligaments and veſſels are attached, ſuch as the back, loins, and inſide of the thighs; and by this compreſſion of the uterus, the waters and membranes are ſqueezed againſt the os uteri, which is, of conſequence, a little more opened. See fig. 4, 5, 6. of Plate CXI.

FIG. 4. In the ſame view and ſection of the parts with the former figures, repreſents the uterus in the eighth or ninth month of pregnancy.

A, The uterus as ſtretched to near its full extent, with the waters, and containing the fœtus entangled in the funis, the head preſenting at the upper part of the pelvis.

BB, The ſuperior part of the oſſa ilium.

CC, The acetabula.

DD, The remaining poſterior parts of the oſſa iſchium.

E, The coccyx.

F, The inferior part of the rectum.

GGG, The vagina ſtretched on each ſide.

H, The os uteri, the neck being ſtretched to its full extent or entirely obliterated.

II, Part of the veſica urinaria.

KK, The placenta, at the ſuperior and poſterior part of the uterus.

LL, The membranes.

M, The funis umbilicalis.

FIG. 5. Gives a front view of twins *in utero* in the beginning of labour.

A, The uterus as ſtretched, with the membranes and waters.

BB, The ſuperior parts of the oſſa ilium.

CC, The acetabula.

DD, The oſſa iſchium.

E, The coccyx.

F, The lower part of the rectum.

GG, The vagina.

H, The os internum ſtretched open about a finger-breadth, with the membranes and waters in time of labour-pains.

II, The inferior part of the uterus, ſtretched with the waters, which are below the head of the child that preſents.

KK, The two placentas adhering to the poſterior part of the uterus, the two fœtus's lying before them, one with its head in a proper poſition at the inferior part of the uterus, and the other ſituated preternaturally with the head to the fundus: the bodies of each are here entangled in their proper funis, which frequently happens in the natural as well as preternatural poſitions.

LLL, The membranes belonging to each placenta.

FIG. 6. Shews, in a lateral view and longitudinal diviſion of the parts, the gravid uterus when labour is ſomewhat advanced.

A, The loweſt vertebra of the back; the diſtance from which to the laſt mentioned vertebra is here ſhewn by dotted lines.

CC, The uſual thickneſs and figure of the uterus when extended by the waters at the latter end of pregnancy.

D, The

Plate CXI.

A. Bell Sculp.t

D, The ſame contracted and grown thicker after the waters are evacuated.
EE, The figure of the uterus when pendulous.
FF, The figure of the uterus when ſtretched higher than uſual, which generally occaſions vomitings and difficulty of breathing.
G, The os pubis of the left ſide.
HH, The os internum.
I, The vagina.
K, The left nympha.
L, The labium pudendi of the ſame ſide.
M, The remaining portion of the bladder.
N, The anus.
OP, The left hip and thigh.

The woman being unable to continue this effort, for any length of time, from the violence of the pain it occaſions, and the ſtrength of the muſcles being thereby a little exhauſted and impaired, the contracting force abates; the tenſion of the os tincæ being taken off, it becomes more ſoft, and contracts a little; ſo that the nervous fibres are relaxed. This remiſſion of pain the patient enjoys for ſome time, until the ſame increaſing force renews the ſtretching pains, irritation, and ſomething like a teneſmus at the os uteri; the compreſſion of the womb again takes place, and the internal mouth is a little more dilated, either by the preſſure of the waters and membranes, or when the fluid is in ſmall quantity, by the child's head forced down by the contraction of the uterus, which in that caſe is in contact with the body of the fœtus. See Plate CXI. where

FIG. 7. Shews the forehead of the fœtus turned backwards to the os ſacrum, and the occiput below the pubes, by which means the narrow part of the head is to the narrow part of the pelvis, that is, between the inferior parts of the oſſa iſchium.
A, The uterus contracted cloſely to the fœtus after the waters are evacuated.
BCD, The vertebræ of the loins, os ſacrum, and coccyx.
E, The anus.
F, The left hip.
G, The perinæum.
H, The os externum beginning to dilate.
I, The os pubis of the left ſide.
K, The remaining portion of the bladder.
L, The poſterior part of the os uteri.

In this manner the labour pains begin, and continue to return periodically, growing ſtronger and more frequent, until the os uteri is fully dilated, and the membranes are depreſſed and broke; ſo that the waters are diſcharged, the uterus contracts, and, with the aſſiſtance of the muſcles, the child is forced along and delivered.

Of ABORTIONS.

A MISCARRIAGE that happens before the tenth day, was formerly called an efflux, becauſe the embryo and ſecundines are not then formed, and nothing but the liquid conception, or genitura, is diſcharged. From the tenth day to the third month it was known by the term expulſion, the embryo and ſecundines being ſtill ſo ſmall, that the woman is in no great danger from violent flooding.

If ſhe parted with her burden betwixt that period and the ſeventh month, ſhe was ſaid to ſuffer an abortion; in which caſe ſhe underwent greater danger, and was delivered with more difficulty than before; becauſe the uterus and veſſels being more diſtended, a larger quantity of blood was loſt in a ſhorter time, the fœtus was increaſed in bulk, and the neck of the womb is not yet fully ſtretched: beſides, ſhould the child be born alive, it will be ſo ſmall and tender that it will not ſuck, and ſcarce receive any ſort of nouriſhment.

When delivery happens between the ſeventh month and full time, the woman is ſaid to be in labour: but, inſtead of theſe diſtinctions, if ſhe loſes her burden at any time from conception to the ſeventh or eighth, or even in the ninth month, we now ſay indiſcriminately, ſhe has miſcarried.

The common term of pregnancy is limited to nine ſolar months, reckoning from the laſt diſcharge of the catamenia: yet in ſome, though very few, uterine geſtation exceeds that period.

Of falſe CONCEPTIONS *and* MOLES.

IT was formerly ſuppoſed, that if the parts of the embryo and ſecundines were not ſeparated and diſtinctly formed from the mixture of the male and female ſemen, they formed a maſs, which, when diſcharged before the fourth month, was called a falſe conception; if it continued longer in the uterus, ſo as to increaſe in magnitude, it went under the denomination of a *mola*. But theſe things are now to be accounted for in a more probable and certain manner. Should the embryo die (ſuppoſe in the firſt or ſecond month,) ſome days before it is diſcharged, it will ſometimes be entirely diſſolved; ſo that, when the ſecundines are delivered, there is nothing elſe to be ſeen. In the firſt month, the embryo is ſo ſmall and tender, that this diſſolution will be performed in twelve hours; in the ſecond month, two, three, or four days will ſuffice for this purpoſe; and even in the third month, it will be diſſolved in fourteen or fifteen: beſides the blood frequently forms thick laminæ round the ovum, to the ſurface of which they adhere ſo ſtrongly, that it is very difficult to diſtinguiſh what part is placenta, and what membrane. Even after the embryo and placenta are diſcharged, in the ſecond or third month, the mouth and neck of the womb are often ſo cloſely contracted, that the fibrous part of the blood is retained in the fundus, ſometimes to the fifth or ſeventh day; and when it comes off, exhibits the appearance of an ovum, the external ſurface, by the ſtrong preſſure of the uterus, reſembling a membrane; ſo that the whole is miſtaken for a falſe conception.

This ſubſtance, in bigneſs, commonly equals a pigeon or hen egg; or if it exceeds that ſize, and is longer retained, is diſtinguiſhed by the appellation of *mola*: but this laſt generally happens in women betwixt the age of forty-five and fifty, or later, when their menſes begin to diſappear; ſometimes from internal or external accidents that may produce continued floodings. If the catamenia have

have ceaſed to flow for ſome time in elderly women, and return with pain, ſuch a ſymptom is frequently the forerunner of a cancer; before or after this happens, ſometimes a large fleſh-like ſubſtance will be diſcharged with great pain, reſembling that of labour; and upon examination, appears to be no more than the fibrous part of the blood, which aſſumes that form by being long preſſed in the uterus or vagina.

In this place, it will not be amiſs to obſerve, that the glands of the uterus and vagina will ſometimes increaſe, and diſtend the adjacent parts to a ſurpriſing degree; if (for example) one of the glands of the uterus be ſo obſtructed as that there is a preſſure on the returning vein and excretory duct, the arterial blood will gradually ſtretch the ſmaller veſſels, and conſequently increaſe the ſize of the gland, which will grow larger and larger, as long as the force of the impelled fluid is greater than the reſiſtance of the veſſels that contain it; by which means, a very ſmall gland will be enlarged to a great bulk, and the uterus gradually ſtretched as in uterine geſtation, though the progreſs may be ſo ſlow as to be protracted for years inſtead of months. Nevertheleſs, the os internum will be dilated, and the gland (if not too large to paſs) will be ſqueezed into the vagina, provided it adheres to the uterus, by a ſmall neck; nay, it will lengthen more and more, ſo as to appear on the outſide of the os externum; in which caſe, it may be eaſily ſeparated by a ligature. This diſeaſe will be the ſooner known and eaſier remedied, the lower its origin in the uterus is. But ſhould the gland take its riſe in the vagina, hard by the mouth of the womb, it will ſhew itſelf ſtill ſooner, and a ligature may be eaſily introduced, provided the tumour is not ſo large as to fill up the cavity and hinder the neck of it from being commodiouſly felt. Though the greateſt difficulty occurs, when the gland is confined to the uterus, being too much enlarged to paſs through the os internum.

Sometimes all, or moſt of the glands in the uterus, are thus affected, and augment the womb to ſuch a degree, that it will weigh a great many pounds, and the woman is deſtroyed by its preſſure upon the ſurrounding parts: but, ſhould this indolent ſtate of the tumour be altered by any accident that will produce irritation and inflammation, the parts will grow ſchirrous, and a cancer enſue.

This misfortune, for the moſt part, happens to women, when their menſtrual evacuations leave them; and ſometimes (though ſeldom) to child-bearing women, in conſequence of ſevere labour.

Of the PLACENTA.

THE ovum is formed of the placenta with the chorion and amnion, which are globularly diſtended by the incloſed waters that ſurround the child. The placenta is commonly of a round figure, ſomewhat reſembling an oatcake, about ſix inches in diameter, and one inch thick in the middle, growing a little thinner towards the circumference: it is compoſed of veins and arteries, which are divided into an infinite number of ſmall branches, the venous parts of which unite in one large tube, called the umbilical vein, which brings back the blood, and is ſuppoſed to carry along the nutritive fluid from the veſſels of the chorion and placenta, to the child, whoſe belly it perforates at the navel; from thence paſſing into the liver, where it communicates with the vena portarum and cava. It is furniſhed with two arteries, which ariſe from the internal iliacs of the child, and running up on each ſide of the bladder, perforates the belly where the umbilical vein entered; then they proceed to the placenta, in a ſpiral line, twining round the vein, in conjunction with which they form the funiculus umbilicalis, which is commonly four or five hand-breadths in length, ſometimes only two or three, and ſometimes it extends to the length of eight or ten. The two arteries, on their arrival at the inner ſurface of the placenta, are divided and ſubdivided into minute branches, which at laſt end in ſmall capillaries that inoſculate with the veins of the ſame order. Theſe arteries, together with the umbilical vein, are ſuppoſed to do the ſame office in the placenta which is afterwards performed in the lungs by the pulmonary artery and vein, until the child is delivered and begins to breathe: and this opinion ſeems to be confirmed by the following experiments. If the child and placenta are both delivered ſuddenly, or the laſt immediately after the firſt; and if the child, though alive, does not yet breathe; the blood may be felt circulating, ſometimes ſlowly, at other times with great force, through the arteries of the funis to the placenta, and from thence back again to the child, along the umbilical vein. When the veſſels are ſlightly preſſed, the arteries ſwell between the preſſure and the child, while the vein grows turgid between that and the placenta, from the ſurface of which no blood is obſerved to flow, although it be lying in a baſon, among warm water. As the child begins to breathe, the circulation, though it was weak before, immediately grows ſtronger and ſtronger, and then in a few minutes the pulſation in the navel-ſtring becomes more languid, and at laſt entirely ſtops. If, after the child is delivered, and the navel-ſtring cut, provided the placenta adheres firmly to the uterus, which is thereby kept extended; or, if the womb is ſtill diſtended by another child; no more blood flows from the umbilical veſſels, than what ſeemed to be contained in them at the inſtant of cutting; and this, in common caſes, does not exceed the quantity of two or three ounces; and finally, when, in conſequence of violent floodings, the mother expires, either in time of delivery, or ſoon after it, the child is ſometimes found alive and vigorous, eſpecially if the placenta is ſound; but if tore, then the child will loſe blood as well as the mother.

The external ſurface of the placenta is divided into ſeveral lobes, that it may yield and conform itſelf more commodiouſly to the inner ſurface of the uterus, to which it adheres, ſo as to prevent its being ſeparated by any ſhock or blows upon the abdomen, unleſs when violent.

Thoſe groupes of veins and arteries which enter into the compoſition of the placenta receive external coats from the chorion, which is the outward membrane of the ovum, thick and ſtrong, and forms three fourths of the external globe that contains the waters and the child; the remaining part being covered by the placenta; ſo that theſe two in conjunction conſtitute the whole external ſurface of the ovum. Some indeed alledge, that theſe are inveloped with a cribriform or cellular ſubſtance, by

which they feem to adhere by contact only, to the uterus; and that the inner membrane of the womb is full of little glands, whofe excretory ducts opening into the fundus and neck, fecrete a foft thin mucus, to lubricate the whole cavity of the uterus, which beginning to ftretch in time of geftation, the veffels that compofe thefe glands are alfo diftended; confequently, a greater quantity of this mucus is feparated and retained in this cribriform and cellular fubftance, the abforbing veffels of which take it in, and convey it along the veins, for the nourifhment of the child The womb being therefore diftended in proportion to the increafe of the child, thofe glands are alfo proportionably enlarged; by which means, a larger quantity of the fluid is feparated, becaufe the nutriment of the child muft be augmented in proportion to the progrefs of its growth; and this liquor undergoes an alteration in quality as well as in quantity, being changed from a clear thin fluid into the more vifcous confiftence of milk. In fome cafes this mucus hath been difcharged from the uterus in time of pregnancy, and both mother and child weakened by the evacuation, which may be occafioned by the chorion's adhering too loofely, or being in one part actually feparated from the womb.

Formerly, it was taken for granted by many, that the placenta always adhered to the fundus uteri; but this notion is refuted by certain obfervations, in confequence of which we find it as often fticking to the fides, back and fore parts, and fometimes as far down as the infide of the os uteri. See Plate CXI.

When the placenta is delivered, and no other part of the membrane tore except that through which the child paffed, the opening is near the edge or fide of the placenta, and feldom in the middle of the membranes; and a hog's bladder being introduced at this opening, and inflated, when lying in water, will fhew the fhape and fize of the inner furface of the womb, and plainly difcover the part to which the placenta adhered.

The chorion is, on the infide, lined with the amnion, which is a thin tranfparent membrane, without any veffels fo large as to admit the red globules of blood; it adheres to the chorion by contact, and feems to form the external coat of the funis umbilicalis.

This membrane contains the ferum, in which the child fwims: which fluid is fuppofed to be furnifhed by lymphatic veffels that open into the inner furface of the amnion. If this liquid is neither abforbed into the body of the fœtus, nor taken into the ftomach by fuction at the mouth, there muft be abforbing veffels in this membrane, in the fame manner as in the abdomen and other cavities of the body, where there is a conftant renovation of humidity.

The quantity of this fluid, in proportion to the weight of the fœtus, is much greater in the firft than in the laft month of geftation, being in the one perhaps ten times the weight of the embryo; whereas, in the other, it is commonly in the proportion of one to two: for, fix pounds of water furrounding a fœtus that weighs twelve pounds, is reckoned a large proportion, the quantity being often much lefs; nay, fometimes there is very little or none at all.

In moft animals of the brute fpecies, there is a third membrane called allantois, which refembles a long and wide blind-gut, and contains the urine of the fœtus: it is fituated between the chorion and amnion, and communicates with the urachus that rifes from the fundus of the bladder, and runs along with the umbilical veffels, depofiting the urine in this refervoir, which is attached to its other extremity. This bag hath not yet been certainly difcovered in the human fœtus, the urachus of which, though plainly perceivable, feems hitherto to be quite imperforated.

From the foregoing obfervations upon nutrition, it feems probable, that the fœtus is rather nourifhed by the abforption of the nutritive fluid into the veffels of the placenta and chorion, than from the red blood circulated in full ftream from the arteries of the uterus to the veins of the placenta, and returned by the arteries of the laft to the veins of the firft, in order to be renewed, refined, and made arterial blood in the lungs of the mother.

Of the Child's *fituation in the* Uterus.

The embryo or fœtus, as it lies in the uterus, is nearly of a circular or rather oval figure, which is calculated to take up as little fpace as poffible: the chin refts upon the breafts, the thighs are preffed along the belly, the heels applied to the breech, the face being placed between the knees, while the arms crofs each other round the legs. The head, for the moft part, is down to the lower part of the uterus; and the child being contracted into an oval form, the greateft length is from head to breech: but the diftance from one fide to the other is much lefs than that from the fore to the back part; becaufe the thighs and legs are doubled along the belly and ftomach, and the head bended forwards on the breaft. The uterus being confined by the vertebræ of the loins, the diftance from the back to the fore-part of it muft be lefs than from fide to fide; fo that, in all probability, one fide of the fætus is turned towards the back, and the other to the fore-part of the womb: but, as the back part of the uterus forms a little longifh cavity on each fide of the vertebræ, the fore-parts of the fœtus may therefore for the moft part tilt more backwards than forwards.

It has been generally fuppofed, that the head is turned up to the fundus, and the breech to the os uteri, with the fore-parts towards the mother's belly; and that it remains in this fituation till labour begins, when the head comes downwards, and the face is turned to the back of the mother. Some alledge, that the head precipitates about the end of the eighth or beginning of the ninth month, by becoming fpecifically heavier than the reft of the body. Others affirm, that as the child increafes in bulk, efpecially during the two laft months, the proportion of furrounding water muft be diminifhed, fo as that it is confined in its motion, and, in ftruggling to alter its pofition, the head is moved to the os tincæ, where it remains till delivery. The particulars of this and other theorics may be found in *Mauriceau*, *Le Motte*, *Simpfon*, and *Old*. But, from the following obfervations, it feems more probable, that the head is, for the moft part, turned down to the lower part of the uterus from conception to delivery.

In the firft month, according to fome writers, the embryo

bryo exhibites the figure of a tadpole, with a large head and ſmall body or tail, which gradually increaſes in magnitude, till the arms and thighs begin to bud or ſtrut out, like ſmall nipples, from the ſhoulders and breech: two black ſpecks appear on each ſide of the head, with a little hole or opening between them, which in the ſecond month are eaſily diſtinguiſhed to be the eyes and mouth. See Plate CXI. fig. 2. The legs and arms are gradually formed, while the body turns larger; but the fingers are not ſeparated or diſtinct, till the latter end of the ſecond or beginning of the third month. See Plate CXI. fig. 3. This is commonly the caſe; but ſometimes the bulk and appearance differ conſiderably in different embryos of the ſame age. The younger the embryo, the larger and heavier is the head in proportion to the reſt of the body; and this is the caſe in all the different gradations of the fœtus; ſo that when dropt or ſuſpended by the navel ſtring in water, the head muſt ſink lowermoſt of courſe. Beſides, when women miſcarry in the fourth, fifth, ſixth, and ſeventh months, the head for the moſt part preſents itſelf, and is firſt delivered. See Plate CXI. fig. 3. By the touch in the vagina, the head is frequently felt in the ſeventh, ſometimes in the ſixth, but more frequently in the eighth month; and if the ſame women are thus examined, from time to time, till the labour begins, the head will always be felt of a round firm ſubſtance at the fore-part of the brim of the pelvis, betwixt the os internum and pubes, through the ſubſtance of the vagina and uterus. See Plate CXI. fig. 4. But all thoſe opinions are liable to objections. If the deſcent of the head proceeded from its ſpecific gravity, we would always find it at the os internum, becauſe this reaſon would always prevail; if it were owing to a diminiſhed proportion of water, why ſhould we often find the breech preſented, even when there is a quantity of that fluid large enough to give the head free liberty to riſe again towards the fundus, or (according to the other opinion) to ſink down by its ſpecific gravity to the os internum? Some, indeed, ſuppoſe, that the head always preſents itſelf, except when it is hindered by the funis umbilicalis twiſting round the neck and body, ſo as to impede the natural progreſs: but, were this ſuppoſition juſt, when we turn and deliver by the feet thoſe children that preſented in a preternatural way, we ſhould always find them more or leſs circumvoluted by the navel-ſtring: the funis is as often found twiſted round the neck and body when the head preſents as in any other caſe. That the head is downwards all the time of geſtation, ſeems, on the whole, to be the moſt reaſonable opinion, though it be liable to the objection already mentioned, and ſeems contradictory to the obſervation of ſome authors, who alledge, that in opening women that died in the fifth, ſixth, or ſeventh month, they have found the child's head towards the fundus uteri. But as it lies as eaſy in one poſture as in another, till the birth, this diſpute is of leſs conſequence in the practice of midwifery. It may be uſeful to ſuggeſt, that the wrong poſture of the child in the uterus may proceed,

1. From circumvolutions in the funis umbilicalis. See Plate CXIII. fig. 1. which repreſents, in a front view of the pelvis, the breech of the fœtus preſenting, and dilating the os internum, the membranes being too ſoon broke. The fore-parts of the child are to the poſterior part of the uterus; and the funis, with a knot upon it, ſurrounds the neck, arms, and body.

Or, 2. When there is little or no water ſurrounding the child, it may move into a wrong poſition, and be confined there by the ſtricture of the uterus. See Plate CXIII. fig. 2, 3, 4.

Fig. 2. is the reverſe of fig. 1. the fore-parts of the child being to the fore-part of the uterus.

Fig. 3. repreſents, in a front view of the pelvis, the fœtus compreſſed, by the contraction of the uterus, into a round form, the fore-parts of the former being towards the inferior part of the latter, and one foot and hand fallen down into the vagina. In this figure, the anterior part of the pelvis is removed, by a longitudinal ſection through the middle of the foramen magnum.

AA, The ſuperior parts of the oſſa ilium.

BB, The uterus.

C, The mouth of the womb ſtretched and appearing in

OOOO, The vagina.

D, The inferior and poſterior part of the os externum.

EEEE, The remaining parts of the oſſa pubis and iſchium.

FFFF, The membrana adipoſa.

Fig. 4. repreſents, in the ſame view with fig. 3. the fœtus in the contrary poſition; the breech and fore-parts being towards the fundus uteri, the left arm in the vagina, and the fore arm without the os externum, the ſhoulder being likewiſe forced into the os uteri.

Or, laſtly, The wrong poſition of the child may be the effect of a pendulous belly or narrow pelvis, when the head lies forward over the pubis. See Plate CXI. fig. 6. See alſo Plate CXII. fig. 6. and 7.

Fig. 6. gives a lateral internal view of a diſtorted pelvis, divided longitudinally, with the head of a fœtus of the ſeventh month paſſing the ſame.

ABC, The os ſacrum and coccyx.

D, The os pubis of the left ſide.

E, The tuberoſity of the os iſchium of the ſame ſide.

Fig. 7. gives a ſide view of a diſtorted pelvis, divided longitudinally, with the head of a full grown fœtus ſqueezed into the brim, the parietal bones decuſſating each other, and compreſſed into a conical form.

ABC, The os ſacrum and coccyx.

D, The os pubis of the left ſide.

E, The tuberoſity of the os iſchium.

F, The proceſſus acutus.

G, The foramen magnum.

Of Touching.

Touching is performed by introducing the fore-finger lubricated with pomatum into the vagina, in order to feel the os internum and neck of the uterus; and ſometimes into the rectum, to diſcover the ſtretching of the fundus. By ſome, we are adviſed to touch with the middle finger, as being the longeſt; and by others, to employ both that and the firſt: but the middle is too much encumbered by that on each ſide, to anſwer the purpoſe fully,

fully; and when two are introduced together, the patient never fails to complain. The design of touching is to be informed whether the woman is, or is not with child; to know how far she is advanced in her pregnancy; if she is in danger of a miscarriage; if the os uteri be dilated; and in time of labour to form a right judgment of the case, from the opening of the os internum, and the pressing down of the membranes with their waters; and lastly, to distinguish what part of the child is presented.

It is generally impracticable to discover, by a touch in the vagina, whether or not the uterus is impregnated, till after the fourth month: then the best time for examination is the morning, when the woman is fasting, after the contents of the bladder and rectum have been discharged; and she ought, if necessary, to submit to the inquiry in a standing posture; because, in that case, the uterus hangs lower down in the vagina, and the weight is more sensible to the touch than when she lies reclined. One principal reason of our uncertainty is, when we try to feel the neck, the womb rises up on our pressing against the vagina, at the side of the os internum, (see Plate CXI. fig. 3.) and in some, the vagina feels very tense; but, when the fundus uteri is advanced near the navel, the pressure from above keeps down the os internum so much, that you can generally feel both the neck, and, above that, the stretching of the under part of the uterus. See Plate. CXI. fig. 3.

There is no considerable variation to be felt in the figure of the os internum, except in the latter end of pregnancy, when it sometimes grows larger and softer, (see Plate CXI. fig. 4.) nor do the lips seem to be more closed in a woman with child than in another, especially in the beginning of pregnancy: but, in both cases the os uteri is felt like the mouth of a young puppy or tench. In some the lips are very small; in others, large; and sometimes, though seldom, smoothed over or pointed. In many woman, who have formerly had children and difficult labours, the lips are large, and so much separated, as to admit the tip of an ordinary finger; but a litle higher up, the neck seems to be quite closed.

In the first four months, the neck of the womb may be felt hanging down in the vagina, by pushing up the finger by the side of the os internum; but the stretching of the uterus and upper part of the neck cannot be perceived till the fifth, and sometimes the sixth month; and even then, the uterus must be kept down by a strong pressure upon the belly.

The stretching of the fundus is sometimes felt by the finger introduced into the rectum, before it can be perceived in the vagina; because, in this last method, the uterus recedes from the touch, and rises too high to be accurately distinguished; whereas the finger being introduced into the rectum, passes along the back of the womb almost to the upper part of the fundus, which, in an unimpregnated state, is felt flat on the back part and jetting out at the sides; but the impregnated uterus is perceived like a large round tumour.

About the fifth or sixth month, the upper part of the uterus is so much stretched, as to rise three or four inches above the os pubis, or to the middle space between that and the navel; so that, by pressing the hand on the belly, especially of lean women, it is frequently perceived; and if, at the same time, the index of the other hand be introduced in the vagina, the neck will seem shortened, particulary at the fore-part and sides, and the weight will be sensibly felt; but, if the parietes of the abdomen are stretched after eating, one may be deceived by the pressure of the stomach, because weight and pressure are the same. But all these signs are more perceptible towards the latter end of pregnancy; and in some women the os internum is felt a little open some weeks before the full time, though generally it is not opened till a few days before labour begins.

From the fifth to the ninth month, the neck of the uterus becomes shorter and shorter, and the stretching of the womb grows more and more perceptible. In the seventh month, the fundus rises as high as the navel; in the eight month, to the middle space betwixt the navel and scrobiculus cordis; and in the ninth, even to the scrobiculus, except in pendulous bellies: See Plate CXI fig 4. But all these marks may vary in different women: for when the belly is pendulous, the parts below the navel are much more stretched than those above, and hang over the os pubis; the fundus will then be only equal to, or a little higher than the navel; at other times, the uterus will rise in the latter end of the seventh or eighth month to the scrobiculus cordis. The neck of the womb will, in some, be felt as long in the eighth, as in others in the sixth or seventh month. This variation sometimes makes the examination of the abdomen more certain than the touch of the vagina; and so *vice versa*. At other times we must judge by both. See Plate CXI. fig. 6.

Of the signs of CONCEPTION, *and the equivocal signs of pregnant and obstructed women.*

THE signs of pregnancy are to be distinguished from those that belong to obstructions, by the touch in the vagina and motion of the child, in the fifth or sixth month; sometimes, by the touch in the rectum, before and after the fifth month, when the tumour of the abdomen is plainly perceived.

Most women, a day or two before the irruption of the catamenia, labour under complaints proceeding from a plethora; such as stretching pains in the back and loins, inside of the thighs, breast and head; a sickness and oppression at the stomach, and a fulness of all the viscera of the abdomen; and all these symptoms abate, and gradually vanish, when the discharge begins and continues to flow. But, if the woman be obstructed by any accident or error in the non-naturals, all those complaints continue and increase, and are hardly distinguishable from the symptoms of pregnancy, till the end of the fourth month; at which period, women with child grow better, and all the complaints of fullness gradually wear off; whereas, those who are only obstructed, grow worse and worse. The fundus uteri, in the obstructed patient, is not stretched; the disorder in the stomach is not so violent as in a pregnant woman, and seldom accompanied with reachings; while the women with child is afflicted with a reaching every morning, and subject to longings besides. The first labours under a fullness of the vessels; the last, over and above this complaint, suffers an additional one from the

the diftenfion of the uterus by the impregnated ovum. Obftructions and pregnancy are both accompanied by a ftretching fullnefs in the breafts; but in the laft only, may be perceived the areola, or brown ring, round the nipples, from which, in the laft months, a thin ferum diftils; but this circle is not always fo difcernible as in the firft pregnancy, and even then is uncertain as well as the others.

About the fifth or fixth month, the circumfcribed tumour or ftretching of the uterus is felt above the os pubis; and, by this circumfcription and confiftence, eafily diftinguifhed from the afcites, or dropfy of the abdomen: it is alfo rounder and firmer than thofe fwellings that accompany obftructions, which proceed from a general fullnefs of the veffels belonging to the ligaments and neighbouring vifcera.

On the whole, the difficulty of diftinguifhing between obftructions and pregnancy in the firft months, is fo great, that we ought to be cautious in giving our opinion; and never prefcribe fuch remedies as may endanger the fruit of the womb; but rather endeavour to palliate the complaints, until time fhall difcover the nature of the cafe; and always judge on the charitable fide, when life or reputation is at ftake.

In the fifth or fixth month of uterine geftation, by the touch in the vagina, we perceive the neck of the womb confiderably fhortened, and the ftretching of the lower part of the uterus is then fenfibly felt between the mouth of the womb and the pubes, and on each fide of the neck. See Plate CXI. fig. 3.

In the feventh month, the head of the child is frequently felt refting againft the lower part of the uterus, between the pubes and os internum; and being pufhed upwards towards the fundus, finks down again by its own gravity. All thefe diagnoftics are more plain and certain, the nearer the patient approaches to the time of delivery.

Sometimes, the head is not felt till the eighth or ninth month; and in fome few cafes, not till after the membranes are broke, when it is forced down by the contraction of the uterus, and ftrong labour-pains. This circumftance may be owing to the head's refting above the bafin, efpecially in a narrow pelvis; or to the diftenfion of its belly with air after death, by which the fœtus being rendered fpecifically lighter than the furrounding waters, the body floats up to the fundus, if there is a large quantity of fluid in the membranes; nor is the body always felt when the child lies acrofs the uterus.

How to diftinguifh the falfe LABOUR *from the true, and the means to be ufed on that occafion.*

If the os uteri remains clofe fhut, it may be taken for granted that the woman is not yet in labour, notwithftanding the pains fhe may fuffer: with regard to which, an accurate inquiry is to be made; and if her complaints proceed from an over ftretching fullnefs of the uterus or veffels belonging to the neighbouring parts, blooding in the arm or ancle, to the quantity of fix or eight ounces, ought to be prefcribed, and repeated occafionally. If the pains are occafioned by a loofenefs or diarrhœa, it muft be immediately reftrained with opiates. Cholic pains are diftinguifhed from thofe of labour, by being chiefly confined to the belly, without going off and returning by diftinct intervals: they are for the moft part produced by fæces too long retained in the colon, or by fuch ingefta as occafion a rarefaction or expanfion of air in the inteftines; by which they are violently ftretched and vellicated. This complaint muft be removed by opening glyfters, to empty the guts of their noxious contents: and this evacuation being performed, opiates may be adminiftered to affuage the pains; either to be injected by the anus, taken by the mouth, or applied externally in form of epithem or embrocation.

Sometimes, the os internum may be a little dilated, and yet it may be difficult to judge whether or not the patient be in labour; the cafe, however, may be afcertained, after fome attendance, by thefe confiderations: if the woman is not arrived at her full time; if no foft or glary mucus hath been difcharged from the vagina; if the pains are limited to the region of the belly, without extending to the back and infide of the thighs; if they are flight, and continue without intermiffion or increafe; nay, if they have long intervals, and recur without force fufficient to pufh down the waters and membranes, or child's head, to open the os internum; if this part be felt thick and rigid, inftead of being foft, thin, and yielding; we may fafely pronounce, that labour is not yet begun; and thofe alarms are to be removed as we have directed in the cafe of falfe or cholic poins. Befides, if the pulfe be quick and ftrong, and the patient attacked by ftitches in the fides, back, or head, blooding will be likewife neceffary. See Plate CXI, fig. 4.

The divifion of LABOURS.

A NATURAL labour is when the head prefents, and the woman is delivered by her pains and the affiftance commonly given: but, fhould the cafe be fo tedious and lingering, that we are obliged to ufe extraordinary force, in ftretching the parts, extracting with the forceps, or (to fave the mother's life) in opening the head and delivering with the crotchet, it is diftinguifhed by the appellation of *laborious*: and the *preternatural* comprehends all thofe cafds in which the child is brought by the feet, or the body delivered before the head. Neither do we mind how the child prefents, fo much as the way in which it is delivered: for there are cafes in which the head prefents, and for feveral hours we expect the child will be delivered in the natural way; but if the woman has not ftrength enough to force down the child's head into the pelvis, or in floodings, we are at length obliged to turn and bring it by the feet, becaufe it is fo high that the forceps cannot be applied; and if the child is not large, nor the pelvis narrow, it were pity to deftroy the hopes of the parents, by opening the fkull and extracting with the crotchet. In this cafe, therefore, although the child prefents in a natural way, we are obliged to turn and deliver it in the fame manner as if the fhoulder, breaft, or back, had prefented; and generally, this operation is more difficult than in either of thofe cafes, becaufe, if the waters are all difcharged, and the uterus clofe contracted round the fœtus, it is more difficult to raife the head to the fundus. When the breech prefents, we are frequently

ly obliged to push it up, and search for the legs; which being found, we proceed to deliver the body, and lastly the head. If the head is large, or the pelvis narrow, and the waters not discharged, we ought, if possible, to turn the child into the natural position.

For a further illustration, and to inform young practitioners that difficult cases do not frequently occur, suppose, of three thousand women in one town or village, one thousand shall be delivered in the space of one year, and in nine hundred and ninety of these births, the child shall be born without any other than common assistance: fifty children of this number shall offer with the forehead turned to one side, at the lower part of the pelvis, where it will stop for some time; ten shall come with the forehead towards the groin, or middle of the pubes; five shall present with the breech, two or three with the face, and one or two with the ear; yet, all these shall be safely delivered, and the case be more or less lingering and laborious, according to the size of the pelvis and child, or strength of the woman: of the remaining ten that make up the thousand, six shall present with the head differently turned, and two with the breech; and these cannot be saved without stretching the parts, using the forceps or crotchet, or pushing up the child in order to bring it by the feet; this necessity proceeding either from the weakness of the woman, the rigidity of the parts, a narrow pelvis, or a large child, *&c.* the other two should lie across, and neither head nor breech, but some other part of the body, present, so that the child must be turned and delivered by the feet. Next year, let us suppose another thousand women delivered in the same place; not above three, six, or eight, shall want extraordinary assistance; nay, sometimes, though seldom, when the child is young, or unusually small, and the mother has strong pains and a large pelvis, it shall be delivered even in the very worst position, without any other help than that of the labour-pains.

As the head, therefore, presents right in nine hundred and twenty of a thousand labours, all such are to be accounted natural; those of the other seventy, that require assistance, may be deemed laborious; and the other ten to be denominated laborious or preternatural, as they are delivered by the head or feet.

In order therefore to render this treatise as distinct as possible, for the sake of the reader's memory, as well as of the dependance and connection of the different labours, they are divided in the following manner: that is accounted natural, in which the head presents, and the woman is delivered without extraordinary help; those births are called laborious or nonnatural, when the head comes along with difficulty, and must be assisted either with the hand in opening the parts, or with the fillet or forceps, or even when there is a necessity for opening and extracting it with the crotchet; and those in which the child is brought by the breech or feet, are denominated preternatural, because the delivery is performed in a preternatural way.

Of the different positions of women in labour.

In almost all countries, the woman is allowed either to sit, walk about, or rest upon a bed, until the os uteri is pretty much dilated by the gravitation of the waters, or (when they are in small quantity) by the head of the fœtus, so that delivery is soon expected; when she is put in such position as is judged more safe, easy, and convenient for that purpose: but the patient may be put upon labour too prematurely, and bad consequences will attend such mistakes.

Among the *Egyptians*, *Grecians*, and *Romans*, the woman was placed upon an high stool; in Germany and Holland they use the chair which is described by Deventer and Heister; and for hot climates the stool is perfectly well adapted; but in northern countries, and cold weather, such a position must endanger the patient's health.

In the West Indies, and some parts of Britain, the woman is seated on a stool made in form of a semicircle: in other places she is placed on a woman's lap; and some, kneeling on a large cushion, are delivered backwards.

In France the position is chiefly that of half sitting and half lying, on the side or end of a bed; or the woman being in naked bed, is raised up with pillows or a bed-chair.

The London method is very convenient in natural and easy labours; the patient lies in bed upon one side, the knees being contracted to the belly, and a pillow put between them to keep them asunder. But the most commodious method is to prepare a bed and a couch in the same room; a piece of oiled cloth or dressed sheep skin is laid across the middle of each; over the under-sheet, and above this, are spread several folds of linen, pinned or tied with tape to each side of the bed and couch; these are designed to spunge up the moisture in time of labour and after delivery, while the oiled cloths or sheep skins below preserve the feather-bed from being wetted or spoiled: for this purpose, some people lay besides upon the bed several under-sheets over one another, so that by sliding out the uppermost every day, they can keep the bed dry and comfortable.

The couch must be no more than three feet wide, and provided with castors; and the woman without any other dress than that of a short or half shift, a linen skirt or petticoat open before, and a bed-gown, ought to lie down upon it, and be covered with cloaths according to the season of the year. She is commonly laid on the left side, but in that particular she is to consult her own ease; and a large sheet being doubled four times or more, one end must be slipt in below her breech, while the other hangs over the side of the couch, to be spread upon the knee of of the accoucheur or midwife, who sits behind her on a low seat. As soon as she is delivered, this sheet must be removed, a soft warm cloth applied to the os externum, and the pillow taken from betwixt her knees: she then must be shifted with a clean, warm, half shift, linen skirt, and bed-gown, and her belly kept firm with the broad head-band of the skirt, the ends of which are to be pinned across each other. These measures being taken, the couch must be run close to the bed-side, and the patient gently moved from one to another; but, if there is no couch, the bed must be furnished with the same apparatus. Some, again, are laid across the foot of the bed, to the head of which the cloaths are previously turned up till after delivery, when the woman's posture is adapted, and then

they are rolled down again to cover and keep her warm: by this expedient, the place of a couch is supplied, and the upper part of the bed preserved soft and clean; whereas those who are laid above the cloaths must be taken up and shifted while the bed is put to rights; in which case, they are subject to fainting; and to such as are very much enfeebled, this fatigue is often fatal.

Women are most easily touched, least fatigued, and kept warmest, when they lie on one side: but if the labour should prove tedious, the Parisian method seems most eligible; because when the patient half sits, half lies, the brim of the pelvis is horizontal, a perpendicular line falling from the middle space between the scrobiculus cordis and navel, would pass exactly through the middle of the basin. In this position, therefore, the weight of the waters, and, after the membranes are broke, that of the child's head, will gravitate downwards, and assist in opening the parts; while the contracting force of the abdominal muscles and uterus, is more free, strong, and equal in this than in any other attitude. Wherefore, in all natural cases, when the labour is lingering or tedious, this or any other position, such as standing or kneeling, ought to be tried, which by an additional force, may help to push along the head, and alter its direction when it does not advance in the right way. Nevertheless, the patient must by no means be too much fatigued.

When the woman lies on the the left side, the right hand must be used in touching, and *vice versa;* unless she is laid across the bed; in which case, either hand will equally answer the same purpose: but, if she lies athwart, with the breech towards the bed's foot, it will be most convenient to touch with the left hand when she is upon the left side, and with the right when in the opposite position. And here it will not be amiss to observe, that in the description of all the laborious and preternatural deliveries treated of in this performance, the reader must suppose the woman lying on her back, except when another posture is prescribed; and that in natural and laborious labours, whether she be upon her side or back, the head and shoulders are a little raised into a reclining posture, so that she may breathe easily, and assist the pains.

But in preternatural labours, when there is a necessity for using great force in turning the child, the head and shoulders must lie lower than the breech, which being close to the side or foot of the bed, ought to be raised higher than either, because when the pelvis is in this situation, the hand and arm are easily pushed up in a right line, along the back part of the uterus, even to its fundus. Sometimes, however, when the feet of the child are towards the belly of the mother, they are more easily felt and managed when she lies on her side. At other times, placing the woman on her knees and elbows on a low couch, according to Daventer's method, will succeed better, by diminishing in part the strong resistance from the pressure and weight of the uterus and child, by which the feet will sometimes be easier found and delivered: but then it is safer for the child, and easier to the operator and mother, to turn her to her back before you deliver the body and head.

Of the management of women in a NATURAL LABOUR.

IN a woman come to full time, labour commonly begins and proceeds in the following manner.

The os uteri is felt soft, and a little opened; the circumference being sometimes thick, but chiefly thin: from this aperture is discharged a thick mucus, which lubricates the parts, and prepares them for stretching. This discharge usually begins some days before, and is accounted the forerunner of real labour: at the same time, the woman is seized at intervals with slight pains that gradually stretch the os uteri, fitting it for a larger dilatation; and when labour actually begins, the pains become more frequent, strong, and lasting.

At every pain, the uterus is strongly compressed by the same effort which expels the contents of the rectum at stool, namely the inflation of the lungs, and the contraction of the abdominal muscles.

If the child be surrounded with a large quantity of waters, (see Plate CXI. fig. 4. and 6.) the uterus cannot come in contact with the body of it, but at every pain the membranes are pushed down by the fluid they contain, and the mouth of the womb being sufficiently opened by this gradual and repeated distension, they are forced into the middle of the vagina; then the uterus contracts and comes in contact with the body of the child, and, if it be small, the head is propelled with the waters. Here the membranes usually break; but, if that is not the case, they are pushed along towards the os externum, which they also gradually open, and appear on the outside, in the form of a large round bag. Mean while, the head advances, and the os externum being by this time fully dilated, is also protruded; when, if the membranes, instead of bursting in the middle of the protuberance, are tore all round at the os externum, the child's head is covered with some part of them, which goes under the name of the caul, or king's hood. If the placenta is, at the same time, separated from the uterus, and the membranes remain unbroken, the secundines, waters, and child, are delivered together; but, if the placenta adheres, they must of course give way: and should they be tore all around from the placenta, the greatest part of the body as well as the head of the child will be inveloped by them, from which it must be immediately disengaged, that the air may have a free passage into the lungs.

When the head is large, so that it does not descend immediately into the pelvis, the membranes are forced down by themselves; and being stretched thinner and thinner, give way; when all the waters which are farther advanced than the head, run out; then the uterus coming in contact with the body of the child, the head is squeezed down into the mouth of the womb, which it plugs up so as to detain the rest of the waters. See Plate CXI. fig. 6.

Sometimes, when the quantity of waters is very small, and the uterus embraces the body of the child, the head, covered with the membranes, is forced downwards, and gradually opens the os internum; but, at its arrival in the middle of the pelvis and vagina, part of the waters will be pushed down before it, sometimes in a large, and sometimes in a small proportion, towards the back part of the pelvis. At other times, when the waters are in small quantity, no part of them are to be distinguished farther than the head, which descending lower and lower, the attenuated membranes are split upon it; while, at the same time, it fills up the mouth of the womb and upper

Plate CXII.

Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3.

Fig. 7.

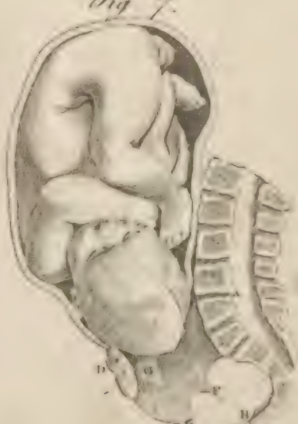

Fig. 6.

Fig. 5.

A. Bell Sculp.

per part of the vagina, in such a manner as hinders the few remaining waters from being discharged at once; though in every pain, a small quantity distils on each side of the head, for lubricating the parts, so as that the child may slip along the more easily.

The uterus contracts, the pains become quicker and stronger, the crown of the head is pushed down to the lower part of the pelvis, against one of the ischia, at its lower extremity; the forehead, being at the upper part of the opposite ischium, is forced into the hollow of the under part of the sacrum, while the vertex and hindhead is pressed below the os pubis, (see Plate, CXI. fig. 7.) from whence it rises in a quarter turn; gradually opening the os externum: the frænum labiorum, or fourchette, perinæum, fundament, and the parts that intervene betwixt that and the extremity of the sacrum, are all stretched outwards in form of a large tumour. The perinæum, which is commonly but one inch from the os externum to the anus, is now stretched to three, the anus to two, and the parts between that and the coccyx are stretched from two inches to about three or more. The broad sacrosciatic ligaments reaching from each side of the lower part of the sacrum, to the under part of each ischium, are also outwardly extended, and the coccyx is forced backward; while the crown of the head, where the lambdoidal crosses the end of the sagittal suture, continues to be pushed along, and dilates the os externum more and more. See

Plate CXII. fig. 1. which is intended principally to shew in what manner the perinæum and external parts are stretched by the head of the fœtus, in a first pregnancy, towards the end of labour.

A, The abdomen.
B, The labia pudendi.
C, The clitoris and its præputium.
D, The hairy scalp of the fœtus swelled at the vertex, in a laborious case, and protrudedto the os externum.
EF, The perinæum and anus pushed out by the head of the fœtus in form of a large tumour.
GG, The parts that cover the tuberosities of hte ossa ischium.
H, The part that covers the os coccygis.

When the head is so far advanced, that the back part of the neck is come below the under part of the os pubis, the forehead forces the coccyx, fundament, and perinæum, backwards and downwards; then the hindhead rises about two or three inches from under the pubes, making a half round turn in its ascent, by which the forehead is equally raised from the parts upon which it pressed, and the perinæum escapes without being split or torn: at the same time, the shoulders advance into the sides of the pelvis at its brim, where it is widest, and, with the body, are forced along and delivered: mean while, by the contraction of the uterus, the placenta and chorion are loosed from the inner surface to which they adhered, and forced through the vagina, out at the os externum.

When the head rests at first above the brim of the pelvis, and is not far advanced, the fontanelle may be plainly felt with the finger, commonly towards the side of the pelvis: this is the place where the coronal crosses the sagittal suture, and the bones are a little separated from each other, yielding a softness to the touch, by which may be distinguished four sutures, or rather one crossing another. These may be plainly perceived, even before the membranes are broke; yet the examination must not be made during a pain, when the membranes are stretched down and filled with waters; but only when the pain begins to remit, and the membranes to be relaxed; otherwise they may be broke too soon, before the os internum be sufficiently dilated, and the head properly advanced.

When the vertex is come lower down, the sagittal suture only is to be felt; because, as the hindhead descends in the pelvis, the fontanelle is turned more backwards, to the side, or towards the concavity of the sacrum: but, after it has arrived below the under part of the ossa pubis, the lambdoidal may be felt crossing the end of the sagittal suture, the occiput making a more obtuse angle than that of the parietal bones, at the place where the three are joined together. But all these circumstances are more easily distinguished after the membranes are broke, or when the head is so compressed that the bones ride over one another, provided the hairy scalp be not excessively swelled. See Plate CXI. fig. 7.——See also

Plate CXII. fig. 2. which shews in what manner the head of the fœtus is helped along with the forceps, as artificial hands, when it is necessary for the safety of either mother or child.

AABC, The vertebræ of the loins, os sacrum, and coccyx.
D, The os pubis of the left side.
E, The remaining part of the bladder.
FF, The intestinum rectum.
GGG, The uterus.
H, The mons veneris.
I, The clitoris, with the left nympha.
H, The corpus cavernosum clitoridis.
V, The meatus urinarius.
K, The left labium pudendi.
L, The anus.
N, The perinæum.
QP, The left hip and thigh.
R, The skin and muscular parts of the loins.

How and when to break the Membranes.

If the child be surrounded with a large quantity of waters, the uterus cannot come in contact with the body so as to press down the head, until the membranes are pushed a considerable way before it into the vagina; nor even then, until they are broke, and the fluid diminished in such a manner as will allow the womb to contract, and, with the assistance of the pains, force along the child. When the membranes therefore are strong or unadvanced, and continue so long unbroke that the delivery is retarded, provided the os internum be sufficiently dilated, they ought to be broke without further delay; especially if the woman hath been much fatigued or exhausted with labour, or is seized with a violent flooding: in which case, the rupture of the membranes hastens delivery, and the hæmorrhage is diminished by the contraction of the uterus, which

which lessens the mouths of the vessels that are also compressed by the body of the child.

The common method of breaking the membranes is by thrusting the finger against them when they are protruded with the waters during the pain, or by pinching them with the finger and thumb; but if they are detained too high to be managed in either of these methods, the hand may be introduced into the vagina, if the os externum is so lax as to admit it easily; and if this cannot be done without giving much pain, the fore and middle fingers being pushed into the vagina with the other hand, let a probe or pair of pointed scissars be directed along and between them, and thrust through the membranes, when they are pushed with the waters below the head. This operation must be cautiously performed, lest the head should be wounded in the attempt; and as for the membranes, let the opening be never so small, the waters are discharged with force sufficient to tear them asunder.

If the vertex, instead of resting at the side of the brim of the pelvis, or at the os pubis, is forced further down to the os internum, and the waters happen to be in small quantity, the head is pushed forwards, and gradually opens the mouth of the womb without any sensible interposition of the waters: then it advances by degrees into the vagina, and the membranes being split or tore, little or nothing is discharged until the body of the child be delivered: and in this case, the hair of the head being plainly felt, will be a sufficient indication that the membranes are broke. If no hair is to be felt, but a smooth body presents itself to the touch; and the woman has undergone many strong pains, even after the mouth of the womb hath been largely dilated, and the head forced into the middle of the pelvis; you may conclude, that delivery is retarded by the rigidity of the membranes; that there is but a small quantity of waters; and that, if the containing sacs were broke, the head would come along without further hesitation.

Sometimes, no waters can be felt while the head is no farther advanced than the upper part of the pelvis, because it plugs up the passage and keeps them from descending; but, as it advances downwards, the uterus contracts, and they are forced down in a small quantity towards the back part: from thence, as the head descends, or even though it should stick in that situation, they are pushed farther down, and the membranes may be easily broke; but the task is more difficult when no waters come down, and the membranes are contiguous to the head. In this case, they must be scratched a little during every pain, with the nail of a finger, which, though short and smooth, will, by degrees, wear them thinner and thinner, until they split upon the head by the force of labour. Yet this expedient ought never to be used until you are certain that delivery is retarded by their rigidity; for, if that be not the hindrance, the difficulty must proceed from the weakness of the woman, a large head, or narrow pelvis: in which case, the delivery is a work of time, and will be obstructed by the premature discharge of the waters, which by gradually passing by the head, ought to keep the parts moist and slippery, in order to facilitate the birth: for when the membranes are not broke until the head is forced into the middle of the pelvis, the largest part of it being then past the upper part of the sacrum, is commonly squeezed along, opens the os externum, and is delivered before all the waters are discharged from the uterus; so that what remains, by moistening and lubricating the parts, help the shoulders and body to pass with more ease. When the membranes are too soon broke, the under part of the uterus contracts sometimes so strongly before the shoulders, that it makes the resistance still greater.

In most natural labours, the space betwixt the fore and back fontanelles, *viz.* the vertex, presents to the os internum, and the forehead is turned to the side of the pelvis; because the basin at the brim is widest from side to side; and frequently, before the head is pushed in and fast wedged among the bones, the child (after a pain) is felt to move and turn it to that side or situation in which it is least pressed and hurt, if it was not presenting in that position before: but this position of the head may alter, *viz.* in those where it is as wide, or wider, from the back part to the fore part of the brim, than from side to side, the forehead may be turned backwards or forwards. But this form of the pelvis seldom happens.

This posture is always observed in a narrow pelvis, when the upper part of the sacrum jets forward to the pubes; but, as the child is forced lower down, the forehead turns into the hollow at the inferior part of the sacrum, because the vertex and occiput find less resistance at the lower part of the ossa pubis than at the ischium, to which it was before turned; the pelvis being at the pubes, as formerly described, no more than two inches in depth, whereas at the ischium it amounts to four. If, therefore, the forehead sticks in its former situation, without turning into the hollow, it may be assisted by introducing some fingers, or the whole hand, into the vagina, during a pain, and moving it in the right position.

When the head of the fœtus presents, and is forced along in any of those positions, the labour is accounted natural; and little else is to be done, but to encourage the woman to bear down with all her strength in every pain, and to rest quietly during each interval: if the parts are rigid, dry, or inflamed, they ought to be lubricated with pomatum, hog's lard, butter, or *ung. althea:* the two first are most proper for the external parts; and the the two last (as being harder and not so easily melted) ought to be put up into the vagina, to lubricate that and the os internum.

The mouth of the womb and os externum, for the most part, open with greater difficulty in the first than in the succeeding labours, more especially in women turned of thirty. In these cases, the os externum must be gradually dilated in every pain, by introducing the fingers in form of a cone, and turning them round, so as to stretch the parts by gentle degrees; and the whole hand being admitted into the vagina, it will be sometimes found necessary to insinuate the fingers with the flat of the hand between the head and os internum: for, when this precaution is not taken in time, the os uteri is frequently pushed before the head (especially that part of it next the pubes) even through the os externum; or if the head passes the mouth of the womb, it will protrude the parts at the os externum, and will endanger a laceration in the perinæum.

perinæum. This dilatation, however, ought to be cautiously performed, and never attempted except when it is absolutely necessary; even then it must be effected slowly, and in time of a pain, when the woman is least sensible of the dilating force.

When the labour happens to be lingering, though every thing be in a right posture, if the assistants are clamorous, and the woman herself too anxious and impatient to wait the requisite time without complaining, the labour will be actually retarded by her uneasiness, which we must endeavour to surmount by arguments and gentle persuasion; but if she is not to be satisfied, and strongly impressed with an opinion that certain medicines might be administered to hasten delivery, it will be convenient to prescribe some innocent medicine, that she may take between whiles, to beguile the time and please her imagination: but, if she is actually weak and exhausted, it will be necessary to order something that will quicken the circulating fluids, such as preparations of amber, castor, myrrh, volatile spirits, the *pulv. myrrh. composit.* of the *London*, or *pulv. ad partum* of the *Edinburgh Pharmacopœia*, with every thing in point of diet and drink that nourishes and strengthens the body. If the patient is of a plethoric habit, with a quick strong pulse, the contrary method is to be used, such as venæsection, antiphlogistic medicines, and plentiful draughts of weak diluting fluids.

How to behave when the birth is obstructed by the navel-string or shoulders of the child, or a narrow pelvis.

ALTHOUGH the head is pushed down into the pelvis, and the vertex employed in opening the os externum, the forehead being lodged in the concavity formed by the coccyx and lower part of the sacrum; yet frequently after the labour-pain is abated, the head again is withdrawn by the navel-string happening to be twisted round the neck; or when the shoulders, instead of advancing, are retarded at the brim of the pelvis, one resting over the ossa pubis, while the other is fixed at the sacrum; or when (the waters having been long evacuated) the under-part of the uterus contracts round the neck and before the shoulders, keeping up the body of the child.

When the head is therefore drawn back by any of these obstacles, and the delivery hath been retarded during several pains, one or two fingers being introduced into the rectum before the pain goes off, ought to press upon the forehead of the child at the root of the nose, great care being taken to avoid the eyes: this pressure detains the head till the return of another pain, which will squeeze it farther down, while the fingers pushing slowly and gradually, turn the forehead half round outwards and half round upwards. By this assistance, and the help of strong pains, the child will be forced along, although the neck be entangled in the navel-string; for, as the child advances, the uterus contracts, and consequently the placenta is moved lower: the funis umbilicalis will also stretch a little, without obstructing the circulation.

The head being thus kept down, the shoulders too are pressed in every succeeding pain until they are forced into the pelvis, when the whole comes along without further difficulty. And this expedient will, moreover, answer the purpose, when the under-part of the uterus or os internum is contracted round the neck of the child, and before the shoulders; also, when the head is very low, pressing a finger on each side of the coccyx externally will frequently assist in the same manner; also in lingering cases, when the woman is weak, the head large, or the pelvis narrow, you may assist the delivery by gently stretching both the os externum and internum with your fingers, in time of the pains, which will increase the same, as well as dilate; but this is only to be done when absolutely necessary, and with caution, and at intervals, for fear of inflaming or lacerating the parts.

Over and above these obstacles, the head may be actually delivered and the body retained by the contraction of the os externum round the neck, even after the face appears externally. In this case it was generally alledged that the neck was close embraced by the os internum; but this seldom happens when the head is delivered, because then the os internum is kept dilated on the back-part and sides by the breast and arms of the fœtus, unless it be forced low down with or before the head.

When the head is delivered and the rest of the body retained from the largeness or wrong presenting of the shoulders, or by the navel string's being twisted round the body or neck of the child, the head must be grasped on each side, the thumbs being applied to the occiput, the fore and middle fingers extended along each side of the neck, while the third and fourth of each hand supsupport each side of the upper jaw: thus embraced, the head must be pulled streight forwards; and if it will not move easily along, the force must be increased, and the directions varied from side to side, or rather from shoulder to shoulder, not by sudden jerks, but with a slow, firm, and equal motion. If the body cannot be moved in this manner, though you have exerted as much force as possible without running the risk of over-straining the neck, you must endeavour to slip the turns of the navel-string over the head: but should this be found impracticable, you ought not to trifle in tying the string at two places, and cutting betwixt the ligatures, as some people have advised: such an operation would engross too much time; besides, the child is in no danger of suffocating from the stricture of the funis, because it seldom or never breaths before the breast is delivered.

The better method is, immediately to slide along one or two fingers, either above or below, to one of the arm-pits; by which you try to bring along the body, while, with the other hand, you pull the neck at the same time: if it still continues unmoved, shift hands, and let the other arm-pit sustain the force; but, if this fail, cut the navel-string, and tie it afterwards. If the shoulders lie so high that the fingers cannot reach far enough to cut or take sufficient hold, let the flat of the hand be run along the back of the child: or should the os externum be strongly contracted round the neck, push up your hand along the breast, and pull as before: and should this method fail, you must have recourse to the blunt hook introduced and fixed in the arm pit; but this expedient must be used with caution, lest the child should be injured, or the parts lacerated.

The child being born, the funis umbilicalis muſt be divided, and the placenta delivered, according to the directions that will occur in the ſequel.

How to manage the Child *after* Delivery.

The child being delivered, ought to be kept warm beneath the bed-cloaths, or immediately covered with a warmed flanel or linen cloth: if it cries and breathes, the umbilical cord may be tied and cut, and the child delivered to the nurſe without delay; but, if the air does not immediately ruſh into the lungs, and the circulation continues between it and the placenta, the operation of tying and cutting muſt be delayed, and every thing tried to ſtimulate, and ſometimes to give pain. If the circulation is languid, reſpiration begins with difficulty, and proceeds with long intervals; and if it be entirely ſtopped in the funis; the child, if alive, is not eaſily recovered; ſometimes, a great many minutes are elapſed before it begins to breathe. Whatever augments the circulating force, promotes reſpiration; and as this increaſes, the circulation grows ſtronger, ſo that they mutually aſſiſt each other. In order to promote the one and the other, the child is kept warm, moved, ſkaken, whipt; the head, temples, and breaſt rubbed with ſpirits, garlick, onion, or muſtard applied to the mouth and noſe; and the child has been ſometimes recovered by blowing into the mouth with a ſilver canula, ſo as to expand the lungs.

When the placenta is itſelf delivered, immediately or ſoon after the child, by the continuance of the labour-pains, or hath been extracted by the operator, that the uterus may contract, ſo as to reſtrain too great a flooding; in this caſe, if the child has not yet breathed, and a pulſation is felt in the veſſels, ſome people (with good reaſon) order the placenta, and as much as poſſible of the navel-ſtring, to be thrown into a baſon of warm wine or water, in order to promote the circulation between them and the child; others adviſe us to lay the placenta on the child's belly, covered with a warm cloth; and a third ſet order it to be thrown upon hot aſhes: but, of theſe, the warm water ſeems the moſt innocent and effectual expedient. Nevertheleſs, if the placenta is ſtill retained in the uterus, and no dangerous flooding enſues, it cannot be in a place of more equal warmth, while the operator endeavours, by the methods above deſcribed, to bring the child to life.

In lingering labours, when the head of the child hath been long lodged in the pelvis, ſo that the bones ride over one another, and the ſhape is preternaturally lengthened, the brain is frequently ſo much compreſſed, that violent convulſions enſue before or ſoon after the delivery, to the danger and oft-times the deſtruction of the child. This diſorder is frequently relieved and carried off, and the bad conſequences of the long compreſſion prevented, by cutting the navel-ſtring before the ligature is made, or tying it ſo ſlighty as to allow two, three, or four large ſpoonfuls to be diſcharged.

If the child has been dead one or two days before delivery, the lips and genitals (eſpecially the ſcrotum in boys) are of a livid hue; if it hath lain dead in the uterus two or three days longer, the ſkin may be eaſily ſtript from every part of the body, and the navel-ſtring appears of the ſame colour with the lips and genitals: in ten or fourteen days, the body is much more livid and mortified, and the hairy ſcalp may be ſeparated with eaſe; and indeed, any part of the child which hath been ſtrongly preſſed into the pelvis, and retained in that ſituation for any length of time, will adopt the ſame mortified appearance.

How to tie the Funis Umbilicalis.

Different practitioners have uſed different methods of performing this operation: ſome propoſing to tie and ſeparate the funis before the placenta is delivered; to apply one ligature cloſe to the belly of the child, with a view to prevent a rupture of the navel; and making another two inches above the former, to divide the rope between the two tyings: by the ſecond ligature, they mean to prevent a dangerous hæmorrhage from the woman, provided the placenta adheres to the uterus. But all theſe precautions are founded upon miſtaken notions, and the following ſeems to be that which is eaſieſt and beſt: If the placenta is not immediately delivered by the pains, and no flooding obliges you to haſten the extraction, the woman may be allowed to reſt a little, and the child to recover; if it does not breathe, or the reſpiration is weak, let the methods above preſcribed be put in practice, with a view to ſtimulate the circulation; but if the child is lively, and cries with vigour, the funis may be immediately tied in this manner: having provided a ligature or two, compoſed of ſundry threads waxed together, ſo as to equal the diameter of a pack-thread, being ſeven inches in length, and knotted at each end, tie the navel-ſtring about two fingers breadth from the belly of the child, by making at firſt one turn, if the funis be ſmall, and ſecuring it with two knots; but if the cord be thick, make two more turns, and another double knot; then cut the funis with a pair of ſharp ſciſſars one finger's breath from the ligature towards the placenta; and in cutting run the ſciſſars as near as poſſible to the root of the blades, elſe the funis will be apt to ſlip from the edge, and you will be obliged to make ſeveral ſnips before you can effect a ſeparation: at the ſame time, guard the points of the ſciſſars with your other hand. The child being waſhed, a linen rag is wrapped round the tied funis; which being doubled up along the belly, a ſquare compreſs is laid over it, and kept firm or moderately tight with what the nurſes call a belly-band, or roller round the body.

This portion of the funis ſoon ſhrinks, turns firſt livid, then black, and about the fifth day falls off cloſe to the belly; and let the navel-ſtring be tied in any part, or at any diſtance whatſoever from the belly, it will always drop off at the ſame place: ſo that ruptures in the navel ſeldom or never depend upon the tying of the funis, but may happen when the compreſs and belly band are not kept ſufficiently firm, and continued ſome time after the ſeparation of the withered portion, eſpecially in thoſe children that cry much: the bandage ought always to be applied ſo ſlight as not to affect reſpiration.

The ligature upon the funis muſt always be drawn ſo tight as to ſhut up the mouths of the veſſels: therefore, if they continue to pour out their contents, another ligature muſt be applied below the former; for if this precaution

caution be neglected, the child will ſoon bleed to death: yet, if the navel-ſtring is cut or tore aſunder at two or three hand-breadths from the belly, and expoſed to the cold without any ligature, the arteries will contract themſelves, ſo as that little or no blood ſhall be loſt; nay, ſometimes, if the funis hath been tied and cut at the diſtance of three finger-breadths from the child's belly, ſo as that it hath been kept from blooding for an hour or two, although the ligature be then untied, and the navel-ſtring and belly chafed, and ſoaked in warm water, no more blood will be diſcharged.

Of delivering the PLACENTA.

THE funis being ſeparated, and the child committed to the nurſe, the next care is to deliver the placenta and membranes, if they are not already forced down by the labour-pains. We have already obſerved, that if there is no danger from a flooding, the woman may be allowed to reſt a little, in order to recover from the fatigue ſhe has undergone; and that the uterus may, in contracting, have time to ſqueeze and ſeparate the placenta from its inner ſurface: during which pauſe alſo, about one, two or three tea-cups full of blood is diſcharged through the funis, from the veſſels of the placenta, which is thus diminiſhed in bulk, ſo that the womb may be the more contracted; and this is the reaſon for applying one ligature only upon the cord. In order to deliver the placenta, take hold of the navel-ſtring with the left hand, turning it round the fore and middle fingers, or wrapping it in a cloth, that it may not ſlip from your graſp; then pull gently from ſide to ſide, and deſire the woman to aſſiſt your endeavour, by ſtraining as if ſhe were at ſtool, blowing forcibly into her hand, or provoking herſelf to reach by thruſting her finger into her throat. If by theſe methods the placenta cannot be brought away, introduce your hand ſlowly into the vagina, and feel for the edge of the cake; which when you have found, pull it gradually along; as it comes out at the os externum, take hold of it with both hands and deliver it, bringing away, at the ſame time, all the membranes, which, if they adhere, muſt be pulled along with leiſure and caution.

When the funis takes its origin towards the edge of the placenta, which is frequently the caſe, the cake comes eaſier off by pulling, than when the navel-ſtring is inſerted in the middle, unleſs it be uncommonly retained by its adheſion to the womb, or by the ſtrong contraction of the os internum. If the funis is attached to the middle of the placenta, and that part preſents to the os internum or externum, the whole maſs will be too bulky to come along in that poſition: in this caſe you muſt introduce two fingers within the os externum, and bring it down with its edge foremoſt.

When the placenta is ſeparated by the contraction of the uterus, in conſequence of its weight and bulk, it is puſhed down before the membranes, and both are brought away inverted.

When part of the placenta hath paſſed the os internum, and the reſt of it cannot be brought along by eaſy pulling, becauſe the os uteri is cloſe contracted round the middle of it, or part of it ſtill adheres to the womb, ſlide the flat of your hand below the placenta through the os internum; and having dilated the uterus, ſlip down your hand to the edge of the cake, and bring it along: but, if it adheres to the uterus, puſh up your hand again, and having ſeparated it cautiouſly, deliver it as before.

If, inſtead of finding the edge or middle of the placenta preſenting to the os externum or internum, you feel the mouth of the womb cloſely contracted, you muſt take hold of the navel-ſtring as above directed, and ſlide your other hand along the funis into the vagina; then ſlowly puſh your fingers and thumb, joined in form of a cone, through the os uteri, along the ſame cord, to the place of its inſertion in the placenta: here let your hand reſt, and feel with your fingers to what part of the uterus the cake adheres: if it be looſe at the lower edge, try to bring it along; but if it adheres, begin and ſeparate it ſlowly, the back of your hand being turned to the uterus, and the fore-part of your fingers towards the placenta: and for this operation the nails ought to be cut ſhort and ſmooth. In ſeparating, preſs the ends of your fingers more againſt the placenta than the uterus; and if you cannot diſtinguiſh which is which, becauſe both feel ſoft (though the uterus is firmer than the placenta, and this laſt more ſolid than coagulated blood;) in this caſe, ſlide down your fingers to its edge, and conduct them by the ſeparated part, preſſing it gently from the uterus, until the whole is diſengaged. Sometimes, when part of it is ſeparated, the reſt will looſen and come along, if you pull gently at the detached portion; but, if this is not effected with eaſe, let the whole of it be ſeparated in the moſt cautious manner: ſometimes, alſo, by graſping the inſide of the placenta with your hand, the whole will be looſened without further trouble. As the placenta comes along, ſlide down your hand and take hold of the lower edge, by which it muſt be extracted, becauſe it is too bulky to be brought away altogether in a heap; and let it be delivered as whole as poſſible, keeping your thumb or fingers fixed upon the navel-ſtring, by which means laceration is often prevented.

When the woman lies on her back, and the placenta adheres to the left ſide of the uterus, it will be moſt commodious to ſeparate the cake with the right hand; whereas the left hand is moſt conveniently uſed when the placenta adheres to the right ſide of the womb; but when it is attached to the forepart, back, or fundus, either hand will anſwer the purpoſe.

That part of the uterus to which the placenta adheres, is kept ſtill diſtended, while all the reſt of it is contracted.

The nearer the adheſion is to the os internum, the eaſier is the placenta ſeparated, and *vice verſa*; becauſe it is difficult to reach up to the fundus, on account of the contraction of the os internum, and lower part of the womb, which are not ſtretched again without great force after they have been contracted for any length of time.

When therefore the placenta adheres to the fundus, and all the lower part of the womb is ſtrongly contracted, the hand muſt be forced up in form of a cone into the vagina, and then gradually dilate the os internum and inferior part of the uterus. If great force is required, exert it ſlowly, reſting between whiles, that the hand may not be

be cramped, nor the vagina in danger of being tore from the womb; for in this caſe, the vagina will lengthen conſiderably upwards.

While you are thus employed, let an aſſiſtant preſs with both hands on the woman's belly; or while you puſh with one hand, preſs with the other, in order to keep down the uterus, elſe it will riſe high up, and roll about like a large ball, below the lax parietes of the abdomen, ſo as to hinder you from effecting the neceſſary dilatation.

When you have overcome this contraction, and introduced your hand into the fundus, ſeparate and bring the placenta along, as above directed; and ſhould the uterus be contracted in the middle like an hour-glaſs, a circumſtance that ſometimes, though rarely happens, the ſame method muſt be practiſed.

In every caſe, and eſpecially when the placenta hath been delivered with difficulty, introduce your your hand after its extraction, in order to examine if any part of the uterus be pulled down and inverted; and if that be the caſe, puſh it up and reduce it without loſs of time, then clear it of the coagulated blood, which otherwiſe may occaſion violent after-pains.

For the moſt part, in ten, fifteen, or twenty minutes, more or leſs, the placenta will come away of itſelf; and though ſome portion of it, or of the membranes, be left in the uterus, provided no great flooding enſues, it is commonly diſcharged in a day or two, without any detriment to the woman: but at any rate, if poſſible, all the ſecundines ought to be extracted at once, and before you leave your patient, in order to avoid reflections.

Of LABORIOUS LABOURS.

How Laborious Labours *are occaſioned.*

All thoſe caſes in which the head preſents, and cannot be delivered in the natural way, are accounted more or leſs laborious, according to the different circumſtances from which the difficulty ariſes: and theſe commonly are, firſt, Great weakneſs, proceeding from loſs of appetite and bad digeſtion; frequent vomitings, diarrhœas, or dyſenteries, floodings, or any other diſeaſe that may exhauſt the patient; as alſo the fatigue ſhe may have undergone by unſkilful treatment in the beginning of labour.

Secondly, From exceſſive grief and anxiety of mind, occaſioned by the unſeaſonable news of ſudden misfortune in time of labour; which often affect her ſo, as to carry off the pains, and endanger her ſinking under the ſhock.

Thirdly, From the rigidity of the os uteri, vagina, and external parts, which commonly happens to women in the firſt birth, eſpecially to thoſe who are about the age of forty: though it may be alſo owing to large calloſities, produced from laceration or ulceration of the parts; or to glands and ſchirrous tumours that block up the vagina.

Fourthly, When the under-part of the uterus is contracted before the ſhoulders, or the body entangled in the navel-ſtring.

Fifthly, From the wrong preſentation of the child's head; that is, when the forehead is towards the groin or middle of the os pubis; when the face preſents with the chin to the os pubis, iſchium, or ſacrum; when the crown of the head reſts above the os pubis, and the forehead or face is preſſed into the hollow of the ſacrum; and laſtly, when one of the ears preſents.

Sixthly, From the extraordinary oſſification of the child's head, by which the bones of the ſkull are hindered from yielding, as they are forced into the pelvis; and form a hydrocephalus or dropſy, diſtending the head to ſuch a degree, that it cannot paſs along until the water is diſcharged.

Seventhly, From a too ſmall or diſtorted pelvis, which often occurs in very little women, or ſuch as have been ricketty in their childhood. See Plate CXII. fig. 6. 7.

In all theſe caſes, except when the pelvis is too narrow and the head too large, provided the head lies at the upper-part of the brim, or (though preſſed into the pelvis) can be eaſily puſhed back into the uterus, the beſt method is, to turn the child and deliver by the feet; but, if the head is preſſed into the middle or lower part of the pelvis, and the uterus ſtrongly contracted round the child, delivery ought to be performed with the forceps; and in all the ſeven caſes, if the woman is in danger, and if you can neither turn, nor deliver with the forceps, the head muſt be opened and delivered with crotchets. Laborious caſes, from ſome of the above recited cauſes, happen much oftener than thoſe we call preternatural; but, thoſe which proceed from a narrow pelvis, or a large head, are of the worſt conſequence. Theſe caſes demand greater judgment in the operator than thoſe in which the child's head does not preſent; becauſe in theſe laſt we know, that the beſt and ſafeſt method is to deliver by the feet; whereas in laborious births, we muſt maturely conſider the cauſe that retards the head from coming along, together with the neceſſary aſſiſtance required; we muſt determine when we ought to wait patiently for the efforts of nature, and when it is abſolutely neceſſary to come to her aid. If we attempt to ſuccour her too ſoon, and uſe much force in the operation, ſo that the child and mother, or one of the two, are loſt, we will be apt to reproach ourſelves for having acted prematurely; upon the ſuppoſition, that if we had waited a little longer, the pains might have, by degrees, delivered the child; or at leaſt, forced the head ſo low, as that we might have extracted it with more ſafety, by the aſſiſtance of the forceps. On the other hand, when we leave it to nature, perhaps by the ſtrong preſſure upon the head and brain, the child is dead when delivered, and the woman ſo exhauſted with tedious labour, that her life is in imminent danger: in this caſe, we blame ourſelves for delaying our help ſo long, reflecting that had we delivered the patient ſooner, without paying ſuch ſcrupulous regard to the life of the child, the woman might have recovered without having run ſuch a dangerous riſk. Doubtleſs it is our duty to ſave both mother and child, if poſſible; but, if that is impracticable, to pay our chief regard to the parent; and in all dubious caſes, to act cautiouſly and circumſpectly, to the beſt of our judgment and ſkill.

If the head is advanced into the pelvis, and the uterus ſtrongly contracted round the child, great force is required to puſh it back into the womb, becauſe the effort muſt be ſufficient

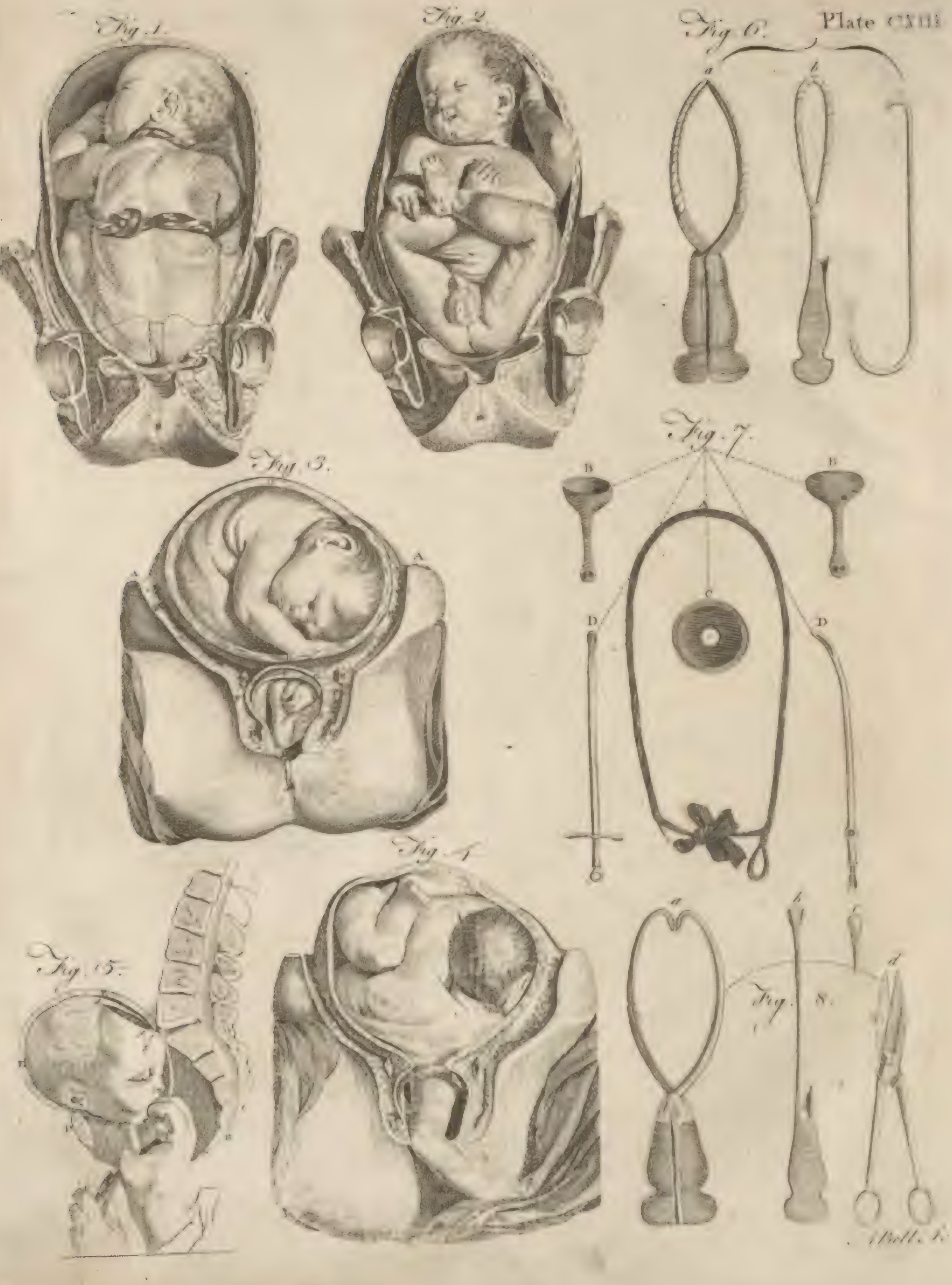
Plate CXIII
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
A
A
B
B
C
D
D
a
b
a
b
c
d
A. Bell. F.

sufficient to stretch the uterus, so as to re-admit the head, together with your hand and arm; and even then the child will be turned with great difficulty.

Should you turn when the head is too large, you may bring down the body of the child, but the head will stick fast above, and cannot be extracted without the help of forceps or crotchets; (see explanation of Plate CXIII. fig. 5. below:) yet the case is still worse in a narrow pelvis, even though the head be of an ordinary size. When things are so situated, you should not attempt to turn, because in so doing you may give the woman a great deal of pain, and yourself much unnecessary fatigue: you ought therefore to try the forceps, and if they do not succeed, diminish the size of the head, and extract it, as shall be afterwards shewn.

Plate CXIII. fig. 5. represents, in a lateral view of the pelvis, the method of extracting, with the assistance of a curved crotchet, the head of the fœtus, when left in the uterus, after the body is delivered and separated from it; either by its being too large, or the pelvis too narrow.

ABC, The os sacrum and coccyx.

D, The os pelvis of the left side.

EE, The uterus.

F, The locking part of the crotchet.

g,h,i. The point of the crotchet on the inside of the cranium.

Of the Fillets *and* Forceps.

We have already observed, that the greatest number of difficult and lingering labours proceed from the head's sticking fast in the pelvis, which situation is occasioned by one of the seven causes recited above: when formerly this was the case, the child was generally lost, unless it could be turned and delivered by the feet; or if it could be extracted alive, either died soon after delivery, or recovered with great difficulty from the long and severe compression of the head, while the life of the mother was endangered from the same cause as above described: for, the pressure being reciprocal, the fibres and vessels of the soft parts contained in the pelvis are bruised by the child's head, and the circulation of the fluids obstructed; so that a violent inflammation, and sometimes a sudden mortification, ensues. If the child could not be turned, the method practised in these cases, was to open the head and extract with the crotchet; and this expedient produced a general clamour among the women, who observed, that when recourse was had to the assistance of a man-midwife, either the mother or child, or both, were lost. This censure, which could not fail of being a great discouragement to male practitioners, stimulated the ingenuity of several gentlemen of the profession, in order to contrive some gentler method of bringing along the head, so as to save the child, without any prejudice to the mother.

Their endeavours have not been without success: a more safe and certain expedient for this purpose hath been invented, and of late brought to greater perfection in this than in any other kingdom; so that if we are called in before the child is dead, or the parts of the woman in danger of a mortification, both the fœtus and mother may frequently be happily saved. This fortunate contrivance is no other than the forceps, which was, as is alledged, first used here by the *Chamberlains*, by whom it was kept as a nostrum, and after their decease so imperfectly known, as to be seldom applied with success: so that different practitioners had recourse to different kinds of fillets or lacks. Blunt hooks also of various make were invented in *England*, *France*, and other parts. The forceps, since the time of Dr *Chamberlain*, have undergone several alterations, particularly in the joining, handles, form, and composition.

The common way of using them formerly, was by introducing each blade at random, taking hold of the head any how, pulling it straight along, and delivering with downright force and violence; by which means, both os internum and externum were often tore, and the child's head much bruised. On account of these bad consequences, they had been altogether disused by many practitioners; some of whom endeavoured, in lieu of them, to introduce divers kinds of fillets over the child's head; but none of them can be so easily used, or have near so many advantages, as the forceps, when rightly applied and conducted.

For my own part, says Dr *Smellie*, finding in practice that, by the directions of *Chapman*, *Giffard*, and *Gregoire* at *Paris*, I frequently could not move the head along without contusing it, and tearing the parts of the woman; for they direct us to introduce the blades of the forceps where they will easiest pass. and taking hold of the head in any part of it, to extract with more or less force, according to the resistance; I began to consider the whole in a mechanical view, and reduce the extraction of the child to the rules of moving bodies in different directions: in consequence of this plan, I more accurately surveyed the dimensions and form of the pelvis, together with the figure of the child's head, and the manner in which it passed along in natural labours: and from the knowledge of these things, I not only delivered with greater ease and safety than before, but also had the satisfaction to find in teaching, that I could convey a more distinct idea of the art in this mechanical light than in any other; and particularly, give more sure and solid directions for applying the forceps, even to the conviction of many old practitioners, when they reflected on the uncertainty attending the old method of application. From this knowledge, too, joined with experience, and hints which have occurred and been communicated to me, I have been led to alter the form and dimensions of the forceps, so as to avoid the inconveniencies that attended the use of the former kinds. See Plate CXIII. fig. 6.

A, The streight forceps, in the exact proportion as to the width between the blades, and length from the points to the locking part; the first being two and the second six inches, which, with three inches and a half, (the length of the handles), make in all eleven inches and a half.

B represents the posterior part of a single blade, in order to shew the width and length of the open part of the same, and the form and dimensions of the whole.

C, The blunt hook, which is used for three purposes: 1. To assist the extraction of the head, after the cranium is opened with the scissars, by introducing the

the ſmall end along the ear on the outſide of the head to above the under-jaw, where the point is to be fixed; the other extremity of the hook being held with one hand, whilſt two fingers of the other are to be introduced into the foreſaid opening, by which holds the head is to be gradually extracted. 2. The ſmall end is uſeful in abortions, in any of the firſt four or five months, to hook down the ſecundines, when lying looſe in the uterus, when they cannot be extracted by the fingers, or labour-pains, and when the patient is much weakened by floodings. 3. The large hook at the other end is uſeful to aſſiſt the extraction of the body, when the breech preſents; but ſhould be uſed with great caution, to avoid the diſlocation or fracture of the thigh.

The lacks or fillets are of different kinds, of which the moſt ſimple is a nooſe made on the end of a fillet or limber garter: but this can only be applied, before the head is faſt jammed in the pelvis, or when it can be puſhed up and raiſed above the brim. The os externum and internum having been gradually dilated, this nooſe muſt be conveyed on the ends of the fingers, and ſlipped over the fore and hind head. There are alſo other kinds differently introduced upon various blunt inſtruments, too tedious either to deſcribe or uſe: but the moſt uſeful of all theſe contrivances, is a fillet made in form of a ſheath, mounted upon a piece of ſlender whale-bone, about two feet in length, which is eaſier applied than any other expedient of the ſame kind. See Plate CXIII. fig. 7.

A repreſents the whale-bone fillet, which may be ſometimes uſeful in laborious caſes, when the operator is not provided with the forceps, in ſudden and unexpected exigencies.

BB, Two views of a peſſary for the prolapſus uteri. After the uterus is reduced, the large end of the peſſary is to be introduced into the vagina, and the os uteri retained in the concave part, where there are three holes to prevent the ſtagnation of any moiſture. The ſmall end without the os externum has two tapes drawn through the two holes, which are tied to four other tapes, that hang down from a belt that ſurrounds the woman's body, and by this means keep up the peſſary. This peſſary may be taken out by the patient when ſhe goes to bed, and introduced again in the morning; but as this ſometimes rubs the os externum, ſo as to make its uſe uneaſy, the round kind, marked C, are of more general uſe. They are made of wood, ivory, or cork, (the laſt covered with cloth and dipt in wax:) The peſſary is to be lubricated with pomatum, the edge forced through the paſſage into the vagina, and a finger introduced in the hole in the middle lays it a-croſs within the os externum. They ought to be larger or ſmaller, according to the wideneſs or narrowneſs of the paſſage, to prevent their being forced out by any extraordinary ſtraining.

DD gives two views of a female catheter, to ſhew its degree of curvature and different parts.

When the head is high up in the pelvis, if the woman has been long in labour, and the waters diſcharged for a conſiderable time, the uterus being ſtrongly contracted, ſo as that the head and ſhoulders cannot be raiſed, or the child turned to be delivered by the feet, while the mother is enfeebled, and the pains ſo weak, that, unleſs aſſiſted, ſhe is in danger of her life; alſo, when the os internum, vagina, and labia pudendi, are inflamed, and tumefied; or when there is a violent diſcharge of blood from the uterus, provided the pelvis is not too narrow, nor the head too large, this fillet may be ſucceſsfully uſed; in which caſe, if the os externum and internum are not already ſufficiently open, they muſt be gradually dilated as much as poſſible, by the hand, which at the ſame time muſt be introduced and paſſed along the ſide of the head, in order to aſcertain the poſition thereof. This being known, let the other hand introduce the double of the whale-bone and fillet over the face and chin, where you can have the beſt purchaſe, and where it will be leaſt apt to ſlip and loſe its hold. This application being effected, let the hand be brought down, and the whale-bone drawn from the ſheath of the fillet, which (after the ends of it are tied together) muſt be pulled during every pain, preſſing at the ſame time with the other hand, upon the oppoſite part of the head, and uſing more or leſs force acccording to the reſiſtance.

The diſadvantage attending all fillets, is the difficulty in introducing and fixing them: and though this laſt is eaſier applied than the others; yet when the vertex preſents, the child's chin is ſo preſſed to the breaſt, that it is often impracticable to inſinuate the fillet between them; and if it is fixed upon the face or hind head, it frequently ſlips off, in pulling: but, granting it commodiouſly fixed, when the head is large, or the pelvis narrow; ſo that we are obliged to pull with great force, the fillet will gall, and even cut the ſoft parts to the very bone; and if the child comes out of a ſudden, in conſequence of violent pulling, the external parts of the woman are in great danger of ſudden laceration: but, if the head is ſmall, and comes along with a moderate force, the child may be delivered by this contrivance, without any bad conſequence: though in this caſe, we find by experience, that unleſs the woman has ſome very dangerous ſymptom, the head will in time ſlide gradually down into the pelvis, even when it is too large to be extracted with the fillet or forceps, and the child be ſafely delivered by the labour-pains, although ſlow and lingering, and the mother ſeems weak and exhauſted, provided ſhe be ſupported with nouriſhing and ſtrengthening cordials.

As the head in the 6th and 7th caſes is forced along the pelvis, commonly in theſe laborious caſes, the bones of the cranium are ſo compreſſed, that they ride over one another, ſo that the bulk of the whole is diminiſhed, and the head, as it is puſhed forward, is, from a round, altered into an oblong figure: when therefore it is advanced into the pelvis, where it ſticks faſt for a conſiderable time, and cannot be delivered by the labour-pains, the forceps may be introduced with great eaſe and ſafety, like a pair of artificial hands, by which the head is very little (if at all) marked, and the woman very ſeldom tore. But if the head is detained above the brim of the pelvis, or a ſmall portion of it only farther advanced, and it appears, that the one being too narrow, or the other too large, the woman cannot be delivered by the ſtrongeſt labour-pains; in

in that caſe, the child cannot be ſaved either by turning and bringing it by the feet, or delivered by the application of fillet or forceps; but the operator muſt unavoidably uſe the diſagreeable method of extracting with the crotchet. Nevertheleſs, in all theſe caſes, the forceps ought firſt to be tried; and ſometimes they will ſucceed beyond expectation, provided the birth is retarded by the weakneſs of the woman, and the ſecond, third, fourth, or fifth obſtructions: but they cannot be depended upon even when the vertex preſents, with the forehead to the ſide or back part of the pelvis, and (though the woman has had ſtrong pains for many hours after the membranes are broke) the head is not forced down into the pelvis, or at leaſt, but an inconſiderable part of it, reſembling the ſmall end of a ſugar-loaf. For, from theſe circumſtances, you may conclude, that the largeſt part of it is ſtill above the brim, and that either the head is too large, or the pelvis too narrow. Even in theſe caſes, indeed, the laſt fillet or a long pair of forceps may take ſuch firm hold, that, with great force and the ſtrong purchaſe, the head will be delivered: but ſuch violence is commonly fatal to the woman, by cauſing ſuch an inflammation, and perhaps laceration of the parts, as is attended with mortification.

When the head is high, the forceps may be locked in the middle of the pelvis; but in that caſe, great care muſt be taken in feeling with the fingers all round, that no part of the vagina be included in the locking. Sometimes, when the head reſts, or is preſſed too much on the forepart or ſide of the pelvis, either at the brim or lower down, by introducing one blade, it may be moved farther down, provided the labour-pains are ſtrong, and the operation aſſiſted by the fingers of the other hand applied to the oppoſite ſide of the head; but if the fingers cannot reach high enough, the beſt method is to turn or move the blade towards the ear of the child, and introduce the other along the oppoſite ſide.

General rules for uſing the Forceps.

The farther the head is advanced in the pelvis, the eaſier it is delivered with the forceps; becauſe then, if in the 6th or 7th caſe, it is changed from a round to an oblong figure, by being forced along by the labour-pains: on the contrary, when the head remains high up, reſting upon the brim of the pelvis, the forceps are uſed with greater difficulty and uncertainty.

The os externum muſt be gradually opened by introducing the fingers one after another, in form of a cone, after they have been lubricated with pomatum, moving and turning them in a ſemicircular motion, as they are puſhed up. If the head is ſo low down that the hand cannot be introduced high up in this form, let the parts be dilated by the fingers turned in the direction of the coccyx, the back of the hand being upwards, next to the child's head: the external parts being ſufficiently opened to admit all the fingers, let the back of the hand be turned to the perinæum, while the fingers and thumb being flattened, will ſlide along betwixt the head and the os ſacrum. If the right hand be uſed, let it be turned a little to the left ſide of the pelvis, becauſe the broad ligament and membrane that fill up the ſpace between the ſacrum and iſchia, will yield and allow more room for the fingers to advance; for the ſame reaſon, when the left hand is introduced, it muſt be turned a little to the right ſide. Having gained your point ſo far, continue to puſh up, until your fingers paſs the os internum; at the ſame time, with the palm of your hand, raiſe or ſcoop up the head; by which means, you will be more at liberty to reach higher, dilate the internal parts, and diſtinguiſh the ſituation and ſize of the head, together with the dimenſions of the pelvis: from which inveſtigation, you will be able to judge, whether the child ought to be turned and brought by the feet, or delivered with the forceps; or, if the labour-pains are ſtrong, and the head preſents tolerably fair, without being jammed in the pelvis, you will reſolve to wait ſome time, in hope of ſeeing the child delivered by the labour-pains, eſpecially when the woman is in no immediate danger, and the chief obſtacle is the rigidity of the parts.

The poſition of the head is diſtinguiſhed by feeling for one of the ears, the fore or ſmooth part of which is towards the face of the child; if it cannot be aſcertained by this mark, the hand and fingers muſt be puſhed farther up, to feel for the face or back part of the neck; but, if the head cannot be traced, the obſervation muſt be taken from the fontanelle, or that part of the cranium where the lambdoidal croſſes the end of the ſagittal ſuture. When the ears of the child are towards the ſides of the pelvis, or diagonal, the forehead being either to the ſacrum or pubes, the patient muſt lie on her back, with her breech a little over the bed. If one ear is to the ſacrum, and the other to the pubes, ſhe muſt be laid on one ſide, with her breech over the bed, as before, her knees being pulled up to her belly, and a pillow placed between them; except when the upper part of the ſacrum jets too much forward; in which caſe, ſhe muſt lie upon her back, as above deſcribed.

The blades of the forceps ought always, if poſſible, to be introduced along the ears; by which means, they approach nearer to each other, gain a firmer hold, and hurt the head leſs than in any other direction: frequently, indeed, not the leaſt mark of their application is to be perceived; whereas, if the blades are applied along the forehead and occiput, they are at a greater diſtance from each other, require more room, frequently at their points preſs in the bones of the ſkull, and endanger a laceration in the os externum of the woman. See Plate CXII. fig. 2.

The woman being laid in a right poſition for the application of the forceps, the blades ought to be privately conveyed between the feather-bed and the cloaths, at a ſmall diſtance from one another, or on each ſide of the patient: that this conveyance may be the more eaſily effected, the legs of the inſtrument ought to be kept in the operator's ſide-pockets. Thus provided, when he ſits down to deliver, let him ſpread the ſheet that hangs over the bed, upon his lap, and under that cover, take out and diſpoſe the blades on each ſide of the patient; by which means, he will often be able to deliver with the forceps, without their being perceived by the woman herſelf, or any other of the aſſiſtants. Some people pin a ſheet to each ſhoulder, and throw the other end over the bed,

bed, that they may be the more effectually concealed from the view of thofe who are prefent: but this method is apt to confine and embarrafs the operator. At any rate, as women are commonly frightened at the very name of an inftrument. it is advifcable to conceal them as much as poffible, until the character of the operator is fully eftablifhed.

The different ways of ufing the Forceps.

When the Head is down to the Os Externum.

When the head prefents fair, with the forehead to the facrum, the occiput to the pubes, and the ears to the fides of the pelvis, or a little diagonal; in this cafe, the head is commonly pretty well advanced in the bafon, and the operator feldom mifcarries in the ufe of the forceps. Things being thus fituated, let the patient be laid on her back, her head and fhoulders being fomewhat raifed, and the breech advanced a little over the fide or foot of the bed; while the affiftants fitting on each fide fupport her legs, at the fame time keeping her knees duly feparated and raifed up to the belly, and her lower parts always covered with the bed cloaths, that fhe may not be apt to catch cold. In order to avoid this inconvenience, if the bed is at a great diftance from the fire, the weather cold and the woman of a delicate conftitution, a chafing-difh with charcoal, or a veffel with warm water, fhould be placed near, or under the bed. Thefe precautions being taken, let the operator place himfelf upon a low chair, and having lubricated with pomatum the blades of the forceps, and alfo his right hand and fingers, flide firft the hand gently into the vagina, pufhing it along in a flattened form, between that and the child's head, until the fingers have paffed the os internum; then, with his other hand, let him take one of the blades of the forceps from the place where it was depofited, and introduce it betwixt his right hand and the head; if the point or extremity of it fhould ftick at the ear, let it be flipt backward a little, and then guided forwards with a flow and delicate motion: when it fhall have paffed the os uteri, let it be advanced ftill farther up, until the reft at which the blades lock into each other be clofe to the lower part of the head, or at leaft within an inch thereof.

Having in this manner introduced one blade, let him withdraw his right hand, and infinuate his left in the fame direction, along the other fide of the head, until his fingers fhall have paffed the os internum; then taking out the other blade from the place of concealment, with the hand that is difengaged, let it be applied to the other fide of the child's head, by the fame means employed in introducing the firft; then the left hand muft be withdrawn, and the head being embraced between the blades, let them be locked in each other. Having thus fecured them, he muft take a firm hold with both hands, and, when the pain comes on, begin to pull the head along from fide to fide, continuing this operation during every pain until the vertex appears through the os externum, and the neck of the child can be felt with the finger below the os pubis; at which time, the forehead pufhes out the perinæum like a large tumour: then let him ftand up, and raifing the handles of the forceps, pull the head upwards alfo, that the forehead being turned half round upwards, the perinæum and lower parts of the os externum may not be tore.

In ftretching the os externum or internum, we ought to imitate nature: for in practice we find, that when they are opened flowly, and at intervals, by the membranes with the waters, or the child's head, the parts are feldom inflamed or lacerated: but in all natural labours, when thefe parts are fuddenly opened, and the child delivered by ftrong and violent pains, without much intermiffion, this misfortune fometimes happens, and the woman is afterwards in great pain and danger.

We ought therefore, when obliged to dilate thofe parts, to proceed in that flow, deliberate manner; and though upon the firft trial, they feel fo rigid, that one would imagine they could never yield or extend; yet, by ftretching with the hand, and refting by intervals, we can frequently overcome the greateft refiftance. We muft alfo, in fuch cafes, be very cautious, pulling flowly, with intermiffions, in order to prevent the fame laceration: for which purpofe too, we ought to lubricate the perinæum with pomatum, during thofe fhort intervals, and keep the palm of one hand clofe preffed to it and the neighbouring parts, while with the other we pull at the extremity of the handles of the forceps; by which means, we preferve the parts, and know how much we may venture to pull at a time. When the head is almoft delivered, the parts, thus ftretched, muft be flipped over the forehead and face of the child, while the operator pulls upwards with the other hand, turning the handles of the forceps to the abdomen of the woman.

This method of pulling upwards, raifes the child's head from the perinæum, and the half-round turn to the abdomen of the mother brings out the forehead and face from below; for, when that part of the hind-head which is joined to the neck, refts at the under-part of the os pubis, the head turns upon it, as upon an axis. In preternatural cafes alfo, the body being delivered, muft in the fame manner be raifed up over the belly of the mother, and at the fame time the perinæum flipt over the face and forehead of the child.

In the introduction of the forceps, let each blade be pufhed up in an imaginary line from the os externum, to the middle fpace betwixt the navel and *fcrobiculus cordis* of the woman; or, in other words, the handles of the forceps are to be held as far back as the perinæum will allow. The introduction of the other hand to the oppofite fide, will, by preffing the child's head againft the firft blade, detain it in its proper place till the other can be applied; or, if this preffure fhould not feem fufficient, it may be fupported by the operator's knee.

When the head is come low down, and cannot be brought farther, becaufe one of the fhoulders refts above the os pubis, and the other upon the upper-part of the facrum, let the head be ftrongly grafped with the forceps, and pufhed up as far as poffible, moving from blade to blade as you pufh up, that the fhoulders may be the more eafily moved to the fides of the pelvis, by turning the face or forehead a little towards one of them; then, the forehead muft be brought back again into the hollow of the facrum, and another effort made to deliver: but, fhould

ſhould the difficulty remain, let the head be puſhed up again, and turned to the other ſide; becauſe it is uncertain which of the ſhoulders reſts on the os pubis, or ſacrum. Suppoſe, for example, the right ſhoulder of the child ſticks above the os pubis, the forehead being in the hollow of the ſacrum; in this caſe, if the forehead be turned to the right-hand ſide of the woman, the ſhoulder will not move; whereas, if it be turned to the left, and the head at the ſame time puſhed a little upwards, ſo as to raiſe and diſengage the parts that were fixed, the right ſhoulder being towards the right hand ſide, and the other to the left ſide of the brim of the pelvis, when the forehead is turned back again into the hollow of the ſacrum, the obſtacle will be removed, and the head be more eaſily delivered. This being performed, let the forceps be unlocked, and the blades diſpoſed cautiouſly under the cloaths ſo as not to be diſcovered; then proceed to the delivery of the child, which, when the navel-ſtring is cut and tied, may be committed to the nurſe. The next care is to wipe the blades of the forceps, ſingly, under the cloaths, ſlide them warily into your pockets, and deliver the placenta.

When the forehead is to the Os Pubis.

WHEN the forehead, inſtead of being towards the ſacrum, is turned forwards to the os pubis, the woman muſt be laid in the ſame poſition as in the former caſe; becauſe here alſo, the ears of the child are towards the ſides of the pelvis, or a little diagonally ſituated, provided the forehead is towards one of the groins. The blades of the forceps being introduced along the ears, or as near them as poſſible, according to the foregoing directions, the head muſt be puſhed up a little, and the forehead turned to one ſide of the pelvis; thus let it be brought along, until the hindhead arrives at the lower part of the iſchium: then the forehead muſt be turned backward, into the hollow of the ſacrum, and even a quarter or more to the contrary ſide, in order to prevent the ſhoulders from hitching on the upper part of the os pubis, or ſacrum, ſo that they may be ſtill towards the ſides of the pelvis; then let the quarter turn be reverſed, and the forehead being replaced in the hollow of the ſacrum, the head may be extracted as above. In performing theſe different turns, let the head be puſhed up or pulled down occaſionally, as it meets with leaſt reſiſtance. In this caſe, when the head is ſmall, it will come along as it preſents; but if large, the chin will be ſo much preſſed againſt the breaſt, that it cannot be brought up with the half-round turn, and the woman will be tore if it comes along. See Plate CXII. where

FIG. 5. ſhews the head of the fœtus, by ſtrong labour-pains, ſqueezed into a longiſh form, with a tumour on the vertex, from a long compreſſion of the head in the pelvis.

K, The tumour on the vertex.

L, The forceps.

M, The veſica urinaria much diſtended with a large quantity of urine from the long preſſure of the head againſt the urethra.

N, The under part of the uterus.

OO, The os uteri.

When it preſents fair at the brim of the Pelvis.

WHEN the forehead and face of the child are turned to the ſide of the pelvis, (in which caſe it is higher than in the firſt ſituation), it will be difficult, if the woman lies on her back, to introduce the forceps ſo as to graſp the head with a blade over each ear; becauſe the head is often preſſed ſo hard againſt the bones, in this poſition, that there is no room to inſinuate the fingers between the ear and the os pubis, ſo as to introduce the blades ſafely, on the inſide of the os internum, or puſh one of them up between the fingers and the child's head. When things are ſo ſituated, the beſt poſture for the woman is that of lying on one ſide, as formerly directed, becauſe the bones will yield a little, and the forceps (of conſequence) may be the more eaſily introduced.

Suppoſe her lying on her left ſide, and the forehead of the child turned to the ſame ſide of the pelvis; let the fingers of the operator's right hand be introduced along the ear, between the head and the os pubis, until they paſs the os internum: if the head is ſo immoveably fixed in the pelvis, that there is no paſſage between them, let his left hand be puſhed up between the ſacrum and the child's head, which being raiſed as high as poſſible, above the brim of the pelvis, he will have room ſufficient for his fingers and forceps; then let him ſlide up one of the blades, with the right hand, remembering to preſs the handle backwards to the perinæum, that the point may humour the turn of the ſacrum and child's head: this being effected, let him withdraw his left hand, with which he may hold the handle of the blade, already introduced, while he inſinuates the fingers of his right hand at the os pubis, as before directed, and puſhes up the other blade, ſlowly and gently, that he may run no riſk of hurting the os internum or bladder; and here alſo keep the handle of it as far backwards as the perinæum will allow: when the point has paſſed the os internum, let him ſlide it up farther, and join the legs by locking them together, keeping them ſtill in a line with the middle ſpace betwixt the navel and ſcrobiculus cordis. Then let him pull along the head, moving it from ſide to ſide, or from one ear of the child to the other; when it is ſufficiently advanced, let him move the forehead into the hollow of the ſacrum, and a quarter-turn farther, then bring it back into the ſame cavity; but, if the head will not eaſily come along, let the woman be turned on her back after the forceps have been fixed, and the handles firmly tied with a garter or fillet; let the hindhead be pulled half round outwards, from below the os pubis, and the inſtrument and child managed as before.

In all thoſe caſes that require the forceps, if the head cannot be raiſed above the brim of the pelvis, or the fingers introduced within the os internum, to guide the points of the forceps along the ears, eſpecially at the oſſa pubis, iſchia, or ſacrum; let the fingers and hand be puſhed up as far as they will go, along the open ſpace betwixt the ſacrum and iſchium; then one of the blades may be introduced, moved to, and fixed over the ear, the ſituation of which is already known: the other hand may be introduced, and the other blade conducted in the ſame manner, on the oppoſite ſide of the pelvis; but, before they

they are locked together, care muſt be taken that they are exactly oppoſite to each other, and both ſufficiently introduced. In this caſe, if the operator finds the upper part of the ſacrum jetting, in ſo much that the point of the forceps cannot paſs it, let him try with his hand to turn the forehead a little backwards, ſo that one ear will be towards the groin and the other towards the ſide of that prominence; conſequently, there will be more room from the blades to paſs along the ears: but if the forehead ſhould remain immoveable, or though moved return to its former place, let one blade be introduced behind one ear, and its fellow before the other, in which caſe the introduction is ſometimes more eaſily performed when the woman lies on her back, than when ſhe is laid on one ſide. See Plate CXII. fig. 2.

When the FACE *preſents.*

WHEN the face preſents, reſting on the upper part of the pelvis, the head ought to be puſhed up to the fundus uteri, the child turned and brought by the feet, becauſe the hind head is turned back on the ſhoulders, and, unleſs very ſmall, cannot be pulled along with the forceps; but ſhould it advance pretty faſt in the pelvis, it will be ſometimes delivered alive, without any reſiſtance. But, if it deſcends ſlowly, or, after it is low down, ſticks for a conſiderable time, the long preſſure on the brain frequently deſtroys the child, if not relieved in time, by turning or extracting with the forceps.

When the head is detained very high up, and no ſigns of its deſcending appear, and the operator having ſtretched the parts with a view to turn, diſcovers that the pelvis is narrow, and the head large, he muſt not proceed with turning, becauſe after this hath been performed, perhaps with great difficulty, the head cannot be delivered without the aſſiſtance of the crotchet. No doubt it would be a great advantage in all caſes where the face or forehead preſents, if we could raiſe the head ſo as to alter the bad poſition, and move it ſo, with our hand, as to bring the crown of the head to preſent: and indeed this ſhould always be tried, and more eſpecially, when the pelvis is too narrow, or the head too large; and when we are dubious of ſaving the child by turning: but frequently this is impoſſible to be done, when the waters are evacuated, the uterus ſtrongly contracted on the child, and the upper part of the head ſo ſlippery as to elude our hold; inſomuch that, even when the preſſure is not great, we ſeldom ſucceed, unleſs the head is ſmall, and then we can ſave the child by turning. If you ſucceed, and the woman is ſtrong, go on as in natural labour; but, if this fails, then it will be more adviſeable to wait with patience for the deſcent of the head, ſo as that it may be delivered with the forceps; and conſequently the child may be ſaved; but, if it ſtill remains in its high ſituation, and the woman is weak and exhauſted, the forceps may be tried; and, ſhould they fail, recourſe muſt be had to the crotchet; becauſe the mother's life is always to be more regarded than the ſafety of the child.

When the face of the child is come down, and ſticks at the os externum, the greateſt part of the head is then ſqueezed down into the pelvis, and if not ſpeedily delivered, the child is frequently loſt by the violent compreſſion of the brain: beſides, when it is ſo low down, it ſeldom can be returned, on account of the great contraction of the uterus. In this caſe, when the chin is turned towards the os pubis, at the lower part of that bone, the woman muſt be laid on her back, the forceps introduced, as formerly directed in the firſt caſe, and when the chin is brought out from under the os pubis, the head muſt be pulled half round upwards; by which means the fore and hind head will be raiſed from the perinæum, and the under part of the os externum prevented from being tore.

If the chin points to either ſide of the pelvis, the woman muſt be laid on her ſide, the blades of the forceps introduced along the ears, one at the os pubis, and the other at the ſacrum; and the chin, when brought lower down, turned to the pubis, and delivered: for the pelvis being only two inches in depth at this place, the chin is eaſily brought from under it, and then the head is at liberty to be turned half round upwards; becauſe the chin being diſengaged from this bone, can be pulled up over it externally; by which means, two inches of room, at leaſt, will be gained, for the more eaſy delivery of the fore and hind head, which are now preſſed againſt the perinæum. When the chin is towards the ſacrum, the hind head preſſed back betwixt the ſhoulders, ſo that the face is kept from riſing up below the os pubis, the head muſt be puſhed up with the hand, to the upper part of the pelvis, and the forceps introduced and fixed on the ears; the hindhead muſt be turned to one ſide of the pelvis, while the chin is moved to the other ſide, and, if poſſible, to the lower part of the iſchium; then the hind head muſt be brought into the hollow of the ſacrum, with the chin below the os pubis, and delivered as above directed. If this cannot be done, let the operator try, with the forceps, to pull down the hind-head below the os pubis, and at the ſame time, with the fingers of the other hand, puſh the face and forehead backwards and upwards into the hollow of the ſacrum.

For when the chin points to the back part of the pelvis, the forehead is ſqueezed againſt the os pubis, while the hind-head is preſſed upon the back, betwixt the ſhoulders; ſo that the head cannot be delivered unleſs, the occiput can be brought out from below the os pubis, as formerly deſcribed. See Plate CXII. fig. 4, and 5.

FIG. 4. ſhews, in the lateral view the face of the child preſenting and forced down into the lower part of the pelvis, the chin being below the pubes, and the vertex in the concavity of the os ſacrum: The water being likewiſe all diſcharged, the uterus appears cloſely joined to the body of the child.

FIG. 5. ſhews, in a lateral view, the head of the child in the ſame poſition as in the former figure.

AB, The vertebræ of the loins, os ſacrum, and coccyx.
C, The os pubis of the left ſide.
D, The inferior part of the rectum.
E, The perinæum.
F, The left labium pudendi.
GGG, The uterus.

The ſum of all that has been ſaid on this head, may be comprehended in the following general maxims.

Young practitioners are often at a loſs to know and judge

judge by the touch in the vagina, when the head is far enough down in the bason for using the forceps. If we were to take our obfervations from what we feel of the head at the os pubis, we fhould be frequently deceived; becaufe in that place the pelvis is only two inches in depth, and the head will feem lower down than it really is: but if, in examining backwards, we find little or no part of it towards the facrum, we may be certain that all the head is above the brim: if we find it down as far as the middle of the facrum, one third of it is advanced; if as far down as the lower part, one half; and in this cafe, the largeft part is equal with the brim. When it is in this fituation, we may be almoft certain of fucceeding with the forceps; and when the head is fo low as to protrude the external parts, they never fail. But thefe things will differ according to different circumftances, that may occafion a tedious delivery.

Let the operator acquire an accurate knowledge of the figure, fhape, and dimenfions of the pelvis, together with the fhape, fize, and pofition of the child's head.

Let the breech of the woman be always brought forwards, a little over the bed, and her thighs pulled up to her belly, whether fhe lies on her fide or back, to give room to apply, and to move the forceps up or down, or from fide to fide.

Let the parts be opened and the fingers pafs the os internum; in order to which, if it cannot be otherwife accomplifhed, let the head be raifed two or three inches, that the fingers may have more room; if the head can be raifed above the brim, your hand is not confined by the bones; for, as we have already obferved, the pelvis is wider from fide to fide, at the brim, than at the lower part; if the fingers are not paft the os uteri, it is in danger of being included betwixt the forceps and the child's head.

The forceps, if poffible, fhould pafs along the ears, becaufe, in that cafe, they feldom or never hurt or mark the head.

They ought to be pufhed up in an imaginary line, towards the middle fpace between the navel and fcrobiculus cordis, otherwife the ends will run againft the facrum.

The forehead ought always to be turned into the hollow of the facrum, when it is not already in that fituation. When the face prefents, the chin muft be turned to below the os pubis, and the hind-head into the hollow of the facrum.

When the fhoulders reft at the pubes, where they are detained, the head muft be turned a large quarter to the oppofite fide, fo as that they may lie towards the fides of the pelvis.

The head muft always be brought out with an half round turn, over the outfide of the os pubis, for the prefervation of the perinæum, which muft at the fame time be fupported with the flat of the other hand, and flide gently backwards over the head.

When the head is fo low as to protrude the parts, in form of a large tumour, and the vertex hath begun to dilate the os externum, but, inftead of advancing, is long detained in that fituation, from any of the forementioned caufes of laborious cafes, and the operator cannot exactly diftinguifh the pofition of the head, let him introduce a finger between the os pubis and the head, and he will frequently find the back part of the neck, or one ear, at the forepart, or towards the fide of the pelvis: when the fituation is known, he needs not ftretch the os externum, and raife the head, as formerly directed; but he may introduce the forceps, and they being properly joined, and their handles tied, pull gently during every pain; or if the pains are gone, at the interval of four or five minutes, that the parts may be flowly dilated, as they are in the natural labour: but, when the fituation cannot be known, the head ought to be raifed. The fame method may alfo be taken when the face prefents, and is low in the pelvis, except when the chin is toward the back part: and in this cafe, the head ought to be raifed likewife.

Almoft all thefe directions are to be followed, except when the head is fmall, in which cafe it may be brought along by the force of pulling: but this only happens when the woman is reduced, and the labour-pains are not fufficient to deliver the child; for, the lower part of the uterus may be ftrongly contracted before the fhoulders, and fo clofe to the neck of the child, as to prevent its advancing, even when the head is fo loofe in the pelvis, that we can fometimes pufh our fingers all round it: and this is ofteneft the occafion of preventing the head's being delivered when low in the pelvis. The difficulty, when high up, is from the reftraint at the brim; and when it paffes that, the head is feldom retained in the lower part, unlefs the patient is weak. In this cafe, we need not wait, becaufe we are commonly certain of relieving the woman immediately with the forceps, by which you prevent the danger that may happen both to the mother and child, by the head's continuing to lodge there too long. This cafe fhould be a caution againft breaking the membranes too foon, becaufe the uterus may contract too forcibly and too long before the fhoulders; when the head in this cafe is advanced one third or half way on the outfide of the os externum, if the pains are ftrong, this laft inconvenience is frequently remedied by introducing your two fingers into the rectum, as formerly directed: by thefe rules, delivery may (for the moft part) be performed with eafe and fafety: neverthelefs, the head is fometimes fo fqueezed and locked in the pelvis, and the hairy fcalp fo much fwelled, that it is impracticable to raife up the head fo as to come at the ears or os internum; or to diftinguifh the futures of the fkull, fo as to know how the heads prefents. In this cafe, the forceps muft be introduced at random, and the uncertainty of the pofition generally removed by remembering, that in thofe cafes, where the head is fqueezed down with great difficulty, the ears are for the moft part towards the os pubis and facrum; and that the forehead feldom turns into the hollow of the facrum, before the occiput is come down to the lower part of the ifchium; and then rifes gradually towards the under part of the os pubis, and the perinæum and anus are forced down before it, in form of a large tumour.

On fuch occafions, the woman being laid on her fide, if one ear is to the facrum and the other to the os pubis, the blades of the forceps are to be introduced; and if they meet with any refiftance at the points, they muft not be forcibly thruft up, left they pafs on the outfide of the os uteri, and tear the vagina, which, together with the

womb

womb, would be included in the instrument, and pulled along with the head: for this reason, if the blade does not easily pass, let it be withdrawn a little downwards, as before directed, and pushed up again, moving the point close to the head; if the ear obstructs its passage, let the point be brought a little outwards: and by these cautious essays, it will at length pass without further resistance, and ought to be advanced a considerable way, in order to certify the operator that he is not on the outside of the os internum.

When the forceps are fixed, and the operator uncertain which way the forehead lies, let him pull slowly, and move the head with a quarter turn, first to one side and then to the other, until he shall have found the direction in which it comes most easily along.

If at any time we find the forceps begin to slip, we must rest, and push them up again gently: but, if they are like to slide off at a side, untie the handles, and move them so as to take a firmer hold, fix as before, and deliver. If we are obliged to hold with both hands, the parts may be supported by the firm application of an assistant's hand; for, without such cautious management, they will run a great risk of being lacerated; a misfortune which rarely happens, when the perinæum is properly pressed back, and the head leisurely delivered. Sometimes, when the head is brought low down, you may take off the forceps, and help along with your fingers on each side of the coccyx, or in the rectum, as directed in the natural labour.

If the head is low down, the ears are commonly diagonal, or to the sides; and when the head is brought down one third, or one half, through the os externum, the operator can then certify himself, whether the forehead is turned to the coccyx or os pubis, by feeling with his finger for the back-part of the neck or ear, betwixt the os pubis and the head; and then move the head as above directed.

Let him try to alter with his hand every bad position of the head; and if it be detained high up in the pelvis, in consequence of the woman's weakness, the rigidity of the parts, the circumvolutions or shortness of the funis, or the contraction of the uterus over the shoulders of the child, the forceps will frequently succeed when the fœtus cannot be turned: but, if the head is large, or the pelvis narrow, the child is seldom saved either by turning or using the forceps, until the head shall be farther advanced. And here it will not be amiss to observe, that the blades of the forceps ought to be new covered with stripes of washed leather after they shall have been used, especially in delivering a woman suspected of having an infectious distemper.

The signs of a Dead Child.

When the head presents, and cannot be delivered by the labour-pains; when all the common methods have been used without success, the woman being exhausted, and all her efforts vain; and when the child cannot be delivered without such force as will endanger the life of the mother, because the head is too large or the pelvis too narrow; it then becomes absolutely necessary to open the head, and extract with the hand, forceps, or crotchet. Indeed this last method formerly was the common practice when the child could not be easily turned, and is still in use with those who do not know how to save the child by delivering with the forceps: for this reason, their chief care and study was to distinguish whether the fœtus was dead or alive; and as the signs were uncertain, the operation was often delayed until the woman was in the most imminent danger; or when it was performed sooner, the operator was frequently accused of rashness, on the supposition that the child might in time have been delivered alive by the labour-pains: perhaps he was sometimes conscious to himself of the justice of this imputation, although what he had done was with an upright intention.

The signs of a dead fœtus were, first, the child's ceasing to move and stir in the uterus. Secondly, The evacuation of meconium, though the breech is not pressed into the pelvis. Thirdly, No perceivable pulsation at the fontanelle and temporal arteries. Fourthly, A large swelling or tumour of the hairy scalp. Fifthly, An uncommon laxity of the bones of the cranium. Sixthly, The discharge of a fœtid ichor from the vagina, the effluvia of which surround the woman and gave rise to the opinion that her breath conveyed a mortified smell. Seventhly, Want of motion in the tongue, when the face presents. Eightly, No perceivable pulsation in the arteries of the funis umbilicalis, when it falls down below the head; nor at the wrist when the arm presents; and no motion of the fingers. Ninthly, The pale and livid countenance of the woman. Tenthly, A collapsing and flaccidity of the breast. Eleventhly, A coldness felt in the abdomen, and weight, from the child's falling like a heavy ball to the side on which she lies. Twelfthly, A separation of the hairy scalp on the slightest touch, and a distinct perception of the bare bones.

All or most of these signs are dubious and uncertain, except the last, which can only be observed after the fœtus hath been dead several days. One may also certainly pronounce the child's death, if no pulsation hath been felt in the navel string for the space of twenty or thirty minutes; but the same certainty is not to be acquired from the arm, unless the skin can be stripped off with ease.

When the Crotchet *is to be used.*

Midwifery is now so much improved, that the necessity of destroying the child does not occur so often as formerly: indeed it never should be done, except when it is impossible to turn, or to deliver with the forceps; and this is seldom the case but when the pelvis is too narrow, or the head too large to pass, and therefore rests above the brim: for this reason, it is not so necessary for the operator to puzzle himself about dubious signs; because in these two cases, there is no room for hesitation: for if the woman cannot possibly be delivered in any other way, and is in imminent danger of her life, the best practice is undoubtedly to have recourse to that method which alone can be used for her preservation, namely, to diminish the bulk of the head.

In this case, instead of destroying, you are really saving a life; for, if the operation be delayed, both mother and child are lost.

The

The method of using the Sciſſars, blunt Hook, and CROTCHET.

WHEN the head preſents, and ſuch is the caſe that the child can neither be delivered by turning, nor extracted with the forceps, and it is abſolutely neceſſary to deliver the woman to ſave her life, this operation muſt then be performed in the following manner.

The operator muſt be provided with a pair of curved crotchets, made according to the improvements upon thoſe propoſed by Meſnard, together with a pair of ſciſſars about nine inches long, with reſts near the middle of the blades, and the blunt hook.

Of the Woman's Poſture.

THE patient ought to be laid on her back or ſide in the ſame poſition directed in the uſe of the forceps; the operator muſt be ſeated on a low chair, and the inſtruments concealed and diſpoſed in the ſame manner, and for the ſame reaſon mentioned in treating of the forceps. The parts of the woman have already, in all likelihood, been ſufficiently dilated by his endeavours to turn or deliver with the forceps; or if no efforts of that kind have been uſed, becauſe by the touch he had learned that no ſuch endeavours would ſucceed, as in the caſe of a large hydrocephalus, when the bones of the cranium are often ſeparated at a great diſtance from each other; or upon perceiving that the pelvis was extremely narrow: If, upon theſe conſiderations, he hath made no trials in which the parts were opened, let him gradually dilate the os externum and internum, as formerly directed.

The head is commonly kept down pretty firm, by the ſtrong contraction of the uterus round the child; but ſhould it yield to one ſide, let it be kept ſteady by the hand of an aſſiſtant, preſſing upon the belly of the woman; let him introduce his hand, and preſs two fingers againſt one of the ſutures of the cranium; then take out his ſciſſars from the place in which they were depoſited, and guiding them by the hand and fingers till they reach the hairy ſcalp, puſh them gradually into it, until their progreſs is ſtopped by the reſts.

If the head ſlips aſide, in ſuch a manner, as that they cannot be puſhed into the ſkull at the ſuture, they will make their way through the ſolid bones, if they are moved in a ſemicircular turn, like the motion of boring, and this method continued till you find the point firmly fixed; for, if this is not obſerved, the points ſlide along the bones.

The ſciſſars ought to be ſo ſharp at the points, as to penetrate the integuments and bones when puſhed with a moderate force; but not ſo keen as to cut the operator's fingers, or the vagina in introducing them.

The ſciſſars being thus forced into the brain, as far as the reſts at the middle of the blades, let them be kept firm in that ſituation; and the hand that was in the vagina being withdrawn, the operator muſt take hold of the handles with each hand, and pull them aſunder, that the blades may dilate and make a large opening in the ſkull; then they muſt be ſhut, turned, and again pulled aſunder, ſo as to make the inciſion crucial; by which means the opening will be enlarged, and ſufficient room made for the introduction of the fingers: let them be afterwards cloſed, and introduced even beyond the reſts; when they muſt again be opened, and turned half round from ſide to ſide, until the ſtructure of the brain is ſo effectually deſtroyed, that it can be evacuated with eaſe. This operation being performed, let the ſciſſars be ſhut and withdrawn; but, if this inſtrument will not anſwer the laſt purpoſe, the buſineſs may be done by introducing the crotchet within the opening of the ſkull. The brain being thus deſtroyed, and the inſtrument withdrawn, let him introduce his right hand into the vagina, and two fingers into the opening which hath been made, that if any ſharp ſplinters of the bones remain, they may be broken off and taken out; leſt they ſhould injure the woman's vagina, or the operator's own fingers.

If the caſe be an hydrocephalus, let him fix his fingers on the inſide and his thumb on the outſide of the opening, and endeavour to pull along the ſkull in time of a pain; but, if labour is weak, he muſt deſire the woman to aſſiſt his endeavours by forcing down; and thus the child is frequently delivered; becauſe, the water being evacuated, the head collapſes of courſe.

But when the pelvis is narrow, the head requires much greater force to be brought along; unleſs the labour-pains are ſtrong enough to preſs it down and diminiſh it, by ſqueezing out the cerebrum: in this caſe, let the operator withdraw his fingers from the opening, and, ſliding them along the head, paſs the os uteri; then, with his left hand, taking one of the crotchets from the place of its concealment, introduce it along his right hand, with the point towards the child's head, and fix it above the chin in the mouth, back part of the neck, or above the ears, or in any place where it will take firm hold: having fixed the inſtrument, let him withdraw his right hand, and with it take hold on the end or handle of the crotchet; then introduce his left to ſeize the bones at the opening of the ſkull (as above directed) that the head may be kept ſteady, and pull along with both hands.

If the head is ſtill detained by the uncommon narrowneſs of the pelvis, let him introduce his left hand along the oppoſite ſide, in order to guide the other crotchet; which being alſo applied and locked or joined with its fellow, in the manner of the forceps, he muſt pull with ſufficient force, moving from ſide to ſide, and as it advances, turn the fore head into the hollow of the ſacrum, and extract as with the forceps, humouring the ſhape of the head and pelvis during the operation, which ought to be performed ſlowly, with great judgment and caution; and from hence it appears abſolutely neceſſary to know how the head preſents, in order to judge how the crotchet muſt be fixed, and the head brought along to the beſt advantage.

If, when the head is delivered in this manner, the body cannot be extracted, on account of its being much ſwelled, of a monſtrous ſize, or (which is moſt commonly the caſe) the narrowneſs of the pelvis; let him deſiſt from pulling, leſt the head ſhould be ſeparated from the body, and introducing one hand ſo as to reach with his fingers to the ſhoulder-blades or breaſt, conduct along it one of the crotchets, with the point towards the fœtus, and fix it with a firm application; then withdrawing his hand, employ it in pulling the crotchet, while the other is

is exerted in the ſame manner upon the head and neck of the child: if the inſtrument begins to loſe its hold, he muſt puſh it farther up, and fixing it again, repeat his efforts, applying it ſtill higher and higher, until the body is extracted.

Of Preternatural Labours.

Preternatural labour happens, when, inſtead of the head, ſome other part of the body preſents to the os uteri. Preternatural labours are more or leſs difficult according to the preſentation of the child, and the contraction of the uterus round its body. The nearer the head and ſhoulders are the os internum or lower part of the uterus, the more difficult is the caſe; whereas, when the head is towards the fundus, and the feet or breech near the os internum, it is more eaſy to turn and deliver.

To begin with the eaſieſt of theſe firſt, it may be proper to divide them into three claſſes. Firſt, how to manage when the feet, breech, or lower parts preſent. Secondly, how to behave in violent floodings; and, when the child preſents wrong before the membranes are broke, how to ſave the waters in the uterus, that the fœtus may be the more eaſily turned: and what method to follow even after the membranes are broke, when all the waters are not evacuated. Thirdly, how to deliver when the uterus is ſtrongly contracted, the child preſenting either with the fore or back parts; and lying in a circular form, or with the ſhoulders, breaſt, neck, face, ear, or vertex, and lying in a longiſh form, with the feet and breech towards the fundus of the womb, which is contracted like a long ſheath, cloſe to the body of the fœtus; and when the fore-parts of the child lie towards the ſide, fundus, fore or back part of the uterus.

The firſt claſs of Preternaturl Labours. *When the feet, breech, or lower parts of the* fœtus *preſent, and the head, ſhoulders, and upper parts are towards the* fundus.

These, for the moſt part, are accounted the eaſieſt, even although the uterus ſhould be ſtrongly contracted round the body of the child, and all the waters diſcharged.

If the knees or feet of the child preſent to the os internum, which is not yet ſufficiently dilated to allow them and the body to come farther down; or, if the woman is weak, wore out with long labour, or endangered by a flooding; let the operator introduce his hand into the vagina, puſh up and ſtretch the os uteri, and bring along the feet; which being extracted, let him wrap a linen cloth round them, and pull until the breech appears on the outſide of the os externum: if the face or fore-part of the fœtus is already towards the back of the uterus, let him perſiſt in pulling in the ſame direction; but, if they are towards the os pubis, or to one ſide, they muſt be turned to the back-part of the uterus; and as the head does not move round equal with the body, he muſt make allowance for the difference in turning, by bringing the laſt one quarter farther than the place at which the head is to be placed; ſo that the face or forehead which was towards one of the groins will be forced to the ſide of the ſacrum, where it joins with the iſchium. This quarter turn of the body muſt be again undone, without affecting the poſition of the head; a cloth may be wrapped round the breech, for the convenience of holding it more firmly; then, placing a thumb along each ſide of the ſpine, and with his fingers graſping the belly, let him pull along the body from ſide to ſide, with more or leſs force, according to the reſiſtance: when the child is delivered as far as the ſhoulders, let him ſlide his hand flattened (ſuppoſe the right, if ſhe lies on her back) between its breaſt and the perinæum, coccyx, and ſacrum of the woman, and introduce the fore or middle finger (or both, if neceſſary) into the mouth of the fœtus; by which means, the chin will be pulled to the breaſt, and the forehead into the hollow of the ſacrum. And this expedient will alſo raiſe upwards the hindhead, which reſts at the os pubis.

When the forehead is come ſo low as to protrude the perinæum, if the woman lies on her back, let the operator ſtand up, and pull the body and head of the child upwards, bringing the forehead with an half-round turn from the under part of the os externum, which will thus be defended from laceration. The application of the fingers in the child's mouth will contribute to bring the head out in this manner, prevent the os externum from hitching on the chin, help along the head, and guard the neck from being overſtrained; a misfortune which would infallibly happen, if the forehead ſhould be detained at the upper part of the ſacrum: nor is there any great force required to obviate this inconvenience, or the leaſt danger of hurting the mouth, if the head is not large: for, if the head cannot be brought along with moderate force, and the operator is afraid of injuring or over-ſtraining the lower jaw, let him puſh his fingers farther up, and preſs on each ſide of the noſe, or on the inferior edges of the ſockets of the eyes. If the legs are come out, and the breech pulled into the vagina, there is no occaſion for puſhing up to open, but only to pull along and manage as above directed; ſtill remembring to raiſe the forehead ſlowly from the perinæum, which may be preſſed back with the fingers of his other hand.

In the caſe of a narrow pelvis, or large head, which cannot be brought along without the riſk of over-ſtraining the neck, let him ſlide up his fingers and hand into the vagina, and bring down one of the child's arms, at the ſame time pulling the body to the contrary ſide, by which means the ſhoulder will be brought lower down: let him run his fingers along the arm, until they reach the elbow, which muſt be pulled downwards with an half round turn to the other ſide, below the breaſt. This muſt not be done with a jerk, but ſlowly and cautiouſly, in order to prevent the diſlocation, bending, or breaking of the child's arm.

Let him again guide his fingers into the child's mouth, and try if the head will come along: if this will not ſucceed, let the body be pulled to the other ſide, ſo as to bring down the other ſhoulder; then ſlide up his left hand, and, extracting the other arm, endeavour to deliver the head. If one finger of his right hand be fixed in the child's mouth, let the body reſt on that arm: let him place the left hand above the ſhoulders, and put a finger on each ſide of the neck: if the forehead is towards one

ſide

fide at the upper part of the pelvis, let him pull it lower down, and gradually turn it into the hollow of the facrum; then ftand up, and, in pulling, raife the body, fo as to bring out the head in an half-round turn, as above directed.

When the forehead is hindered from coming down into the lower part of the facrum by an uncommon fhape of the head or pelvis, and we cannot extract it by bringing it out with an half-round turn at the os pubis, we muft try to make this turn in the contrary direction; and inftead of introducing our fingers into the child's mouth, let the breaft of it reft on the palm of your left hand, (the woman being on her back,) and placing the right on its fhoulders, with the fingers on each fide of the neck, prefs it downwards to the perinæum. In confequence of this preffure, the face and chin being within the perinæum, will move more upwards, and the head come out with an half-round turn from below the os pubis: for the centre of motion is now where the fore-part of the neck preffes at the perinæum; whereas, in the other method, the back part of the neck is againft the lower part of the os pubis, on which the head turns.

If the forehead is not turned to one fide, but fticks at the upper part of the facrum, efpecially when the pelvis is narrow; let him endeavour, with his finger in the mouth, to turn it to one fide of the jetting in of the facrum, becaufe the pelvis is wider at the fides of the brim, and bring it along as before.

If one of the child's arms, inftead of being placed a long the fides of the head, is turned in between the face and facrum, or between the hindhead and os pubis, the fame difficulty of extracting occurs as in a large head or narrow pelvis; and this pofition frequently enfues, when the fore-parts of the child's body are turned from the os pubis down to the facrum: if they are turned to the left fide of the woman, the left hand and arm are commonly brought in before the face, and *vice verfa*; but, in thefe cafes, the elbow is, for the moft part, eafily come at, becaufe it is low down in the vagina, and then there is a neceffity for bringing down one or both arms before the head can be delivered: from whence we may conclude, that thofe authors are fometimes in the wrong, who expreffly forbid us to pull down the arms. Indeed, if the pelvis is not narrow, nor the head very large, and the arms lie along the fides of the head, there is feldom occafion to pull them down; becaufe, the pelvis is wideft at the fides, and the membranes and ligaments that fill up the fpace betwixt the facrum and ifchia yield to the preffure, and make room for the paffage of the head: but when they are fqueezed between the head and the facrum, ifchia, or offa pubis, and the head fticks in the pelvis, they certainly ought to be brought down, or even when the head comes along with difficulty. Neither is the alledged contraction of the os internum round the neck of the child fo frequent as hath been imagined; becaufe, for the moft part, the contraction embraces the head and not the neck: but, fhould the neck alone fuffer, that inconvenience may be removed by introducing the hand into the vagina, and a finger or two into the child's mouth, or on each fide of the nofe: by which means alfo a fufficient dilatation will be preferved in the os externum, which frequently contracts on the neck, as foon as the arms are brought out.

The diameter, from the face or forehead to the vertex, being greater than that from the forehead to the back part of the hindhead or neck, when the hindhead refts at the os pubis, and the forehead at the upper part of the facrum, the head can feldom be brought down, until the operator, by introducing a finger into the mouth, moves the fame to the fide, brings the chin to the breaft, and the forehead into the hollow of the facrum; by which means, the hindhead is raifed, and allowed to come along with greater eafe: and in pulling, half the force only is applied to the neck, the other half being exerted upon the head, by the finger which is fixed in the mouth; fo that the forehead is more eafily brought out, by pulling upwards, with the half-round turn from the perinæum. When the operator, with his fingers in the child's mouth, cannot pull down the forehead into the hollow of the facrum, let him pufh the fore-finger of his left hand betwixt the neck and os pubis, in order to raife the hindhead upwards; which being done, the forehead will come down with lefs difficulty, efpecially if he pufhes up and pulls down at the fame time, or alternately.

If it be difcovered by the touch, that the breech prefents, that the membranes are not yet broke, the woman in no danger, the os internum not yet fufficiently dilated, and the labour-pains ftrong; the midwife ought to wait until the membranes, with the waters, are pufhed farther down, as in the natural labour: for, as they come down through the os uteri into the vagina, they ftretch open the parts contained in the pelvis; and the bulk within the uterus being diminifhed, it contracts and comes in contact with the body of the child; fo that the breech is pufhed along by the mechanical force of the abdominal mufcles operating upon the womb.

The fame confequence will follow even although the membranes are broke; for the waters lubricate the parts as they flow off; and the breech, if not too large, or the pelvis narrow, is pufhed down. In this cafe, when the nates prefent equal and fair to the os uteri, fo it is alfo reafonable to conclude, that when the breech prefents, it lies in the fame manner, but that the fore-parts of the child are rather turned backwards to one fide of the vertebræ of the loins: in this pofition, one hip will prefent, and the other reft on the os pubis; but, when forced along with pains, the laft will be gradually moved more and more to the groin of that fide, and from thence flip down at the fide of the bafin: the lower at the fame time will be forced to the other, and the hollow betwixt the thighs will reft upon the jetting in of the os facrum, and come down in that manner; the thighs on each fide, and the back and round part of the breech paffing in below the arch of the os pubis, which is the beft pofition: but if the back of the child is tilted backwards, then it will be forced down in the contrary direction, and come along with more difficulty, *viz.* the thighs to the os pubis, and back to the facrum; when it is come down to the middle or lower part of the pelvis, let the operator introduce the fore-finger of each hand, along the outfide, to the groins, and, taking hold, pull gently along during a ftrong pain.

If the os externum is fo contracted, that he cannot take

take sufficient hold, let it be opened slowly, so as to allow his hands to be pushed up with ease; when he has insinuated a finger or two in each groin, let him place his thumbs on the thighs, if they are towards the ossa pubis, so as to obtain a firm hold; then pull along from side to side, and, if the back of the child is to the os pubis, continue to assist in this manner, until the body and head are delivered: the legs being commonly stretched up along the belly and breast, when the child is extracted as far as the shoulders, they come out of themselves, or are easily brought down; but, if the belly of the child is turned to one side, or to the os pubis, in that case, when the breech is delivered, he ought to turn the belly down to the sacrum, and the back to the os pubis; and that the face may be also turned to the back of the mother, let him remember the quarter extraordinary, which must be again reversed, and then he may pull along and deliver.

If the body cannot be turned until the thighs and legs are brought down, either on account of the bulk, or because the hold on the breech is not sufficient, let him continue to pull along, until the hams appear on the outside of the os externum; then seize one of the knees with his finger and thumb, and extract that leg; and let the other be brought down in the same manner. If he attempts to pull out the legs, before the hams arrive at this place, the thighs are always in danger of being bent or broke. When the legs are delivered, let him wrap a cloth round the breech of the child, and as the body was pulled down almost as far as the breast, before the legs could be brought out, it must be pushed up again to the navel, or above it; because, without this precaution, the shoulders would be so much engaged in the pelvis, that it would be impracticable to make the motions formerly directed, so as to turn the face to the back of the mother: whereas, when the body is pushed up, those turns can be effected with greater ease, because the belly being in the pelvis, it yields easier to the form of the basin. When the face is turned properly down, let him proceed to deliver, as above directed.

If the breech is detained above the pelvis, either by its uncommon magnitude, or the narrowness of the basin; or if one of the nates is pushed in, while the other rests above the os pubis, sacrum, or to either side; if the woman is low and weak, the pains lingering and insufficient to force the child along; or if she is in danger from a violent flooding: in any of these casea, let him (during every pain) gradually open first the os externum, and then the os internum, with his fingers and hand. Having thus gained admission, let him push up the breech to the fore or back part, or to one side of the uterus, that his hand and arm may have room to slide along the fore-parts or belly of the child, so as to feel the thighs, that will direct him to the legs, which must be brought down with his fingers, while, at the same time, he pushes up the hams with his thumb, that in case the legs lie straight up, they may be extracted with more ease by the flection of the knee, and run the less risk of being bent, broke, or overstrained: for, if they are folded downward, they are the more easily brought out.

If the breech be strongly pressed into the upper part of the pelvis, let him also push it upwards and to one side, that his hand and arm may have free passage; for the higher the breech is raised out of his way, he will be at more freedom to extract the legs.

If both legs cannot be easily brought down, he may safely deliver with one, of which taking hold with a linen cloth wrapped round it, let him slide up his other hand into the vagina, and a finger or two into the outside of the groin which is bent: by these means, the hip will come down the easier, and the leg, which is already extracted, will not be over-strained by sustaining the whole force of pulling the body along.

If the legs lie towards the left side of the woman, who is laid on her back, the right hand must be introduced into the uterus; if they lie to her right side, the left hand will better answer the purpose; and if they are towards her back or belly, either hand may be indifferently used.

In all cases where the breech presents, the safest practice is always to push up and bring down the legs, provided the os uteri is sufficiently dilated, and the waters not wholly discharged. If the waters are evacuated, the uterus strongly contracted around the child, the breech low, so as that it cannot be returned, or so small as to come easily along, we ought then to deliver it accordingly; but, if so large as neither to be pushed up or brought along with the assistance of the fingers, let the operator introduce the curved handle of the blunt crotchet into one of the groins, his fingers into the other, and pull very cautiously, in order to prevent a fracture or dislocation of the thigh bone, which might otherwise happen from the use of this instrument, the blunt point of which must be sufficiently past the groin. A fillet may also be used for the same purpose.

In the foregoing cases the woman was supposed to be laid on her back, her legs supported, and breech to the bed-side; this being generally the best position for delivering the body and head: indeed, when the child is small, she may lie on her side, and the same methods be used in delivering, provided the operator still remembers that in this position the ilium and ischium of one side are down, and the others up. Besides, when the breech is pushed up, in order to bring down the legs, if they lie forewards towards the fore part of the uterus, and the belly is pendulous, he can reach them with the greatest ease when she lies on one side, or, if the resistance is very great, turn her to her knees and elbows; but, when the legs are delivered, if the child is large, or the pelvis narrow, she ought to be turned upon her back, because the body and head can be better and safer delivered by pulling up and down; and in that posture she is also kept more firm, and her thighs less in the operator's way, than when she lies upon her side. See Plate CXIII. fig. 1. and 2.

The second class of PRETERNATURAL LABOURS.

WHEN the membranes are broke, but the face, shoulder, or some other part of the child, being pushed into the pelvis, locks up the os internum, so as that a small quantity of the waters hath been discharged, the uterus is kept from contracting strongly round the child, which is therefore more easily turned than it possibly can be when they are all gone:

When

When, before the membranes are broke, the child is felt through them, preſenting wrong, and at the ſame time the pains puſh them down ſo as to dilate the os internum more or leſs:

When the woman, at any time in the four laſt months, is ſeized with a violent flooding that cannot be reſtrained, and unleſs ſpeedily delivered muſt loſe her life; if labour-pains cannot be brought on by ſtretching the parts, delivery muſt be forced; but, if ſhe is in labour, and the membranes have been puſhed down with the waters, they may be broke; by which means, the flooding is frequently diminiſhed, and the child delivered by the labour-pains.

In theſe three different caſes, if we can prevent the ſtrong contraction of the uterus by keeping up the waters, we can alſo for the moſt part turn the child with great eaſe, even in the very worſt poſitions.

In the firſt caſe, let the operator ſlowly introduce his hand into the vagina, and his fingers between that part of the child which is puſhed down, and the os internum: if in ſo doing he perceives ſome of the waters coming along, he muſt run up his hand as quick as poſſible into the uterus, betwixt the inſide of the membranes and the child's body; the lower part of his arm will then fill up the os externum like a plug, ſo that no more of the waters can paſs; let him turn the child with its head and ſhoulders up to the fundus, the breech down to the lower part of the uterus, and the fore-parts towards the mother's back; let the hand be puſhed no farther up than the middle of the child's body, becauſe, if it is advanced as high as the fundus, it muſt be withdrawn lower, before the child can be turned; and by theſe means the waters will be diſcharged, and the uterus of conſequence contract ſo as to render the turning more difficult.

In the ſecond caſe, when the membranes are not broke, and we are certain that the child does not preſent fair; if the os internum is not ſufficiently dilated, and the woman is in no danger, we may let the labour go on, until the parts are more ſtretched; lubricating and extending the os externum, by degrees, during every pain. Then introducing one hand into the vagina, we inſinuate it in a flattened form, within the osi nternum, and puſh up between the membranes and the uterus, as far as the middle of the womb: having thus obtained admiſſion, we break the membranes by graſping and ſqueezing them with our fingers, ſlide our hand within them, without moving the arm lower down, then turn and deliver as formerly directed; but if, in any of theſe caſes, you find the head is large or the pelvis narrow, bring down the head into the natural poſition, and aſſiſt as directed in lingering or laborious caſes.

If the woman (in the third caſe) is attacked with a violent flooding, occaſioned by a ſeparation of all or any part of the placenta from the uterus, during the laſt four months of pregnancy, and every method has in vain been tried to leſſen and reſtrain the diſcharge, the operator ought to pronounce the caſe dangerous, and prudently declare to the relations of the patient, that unleſs ſhe is ſpeedily delivered, both ſhe and the child muſt periſh, obſerving at the ſame time, that by immediate delivery they may both be ſaved; let him alſo deſire the aſſiſtance and advice of ſome perſon eminent in the profeſſion, for the ſatisfaction of her friends, and the ſupport of his own reputation. Where there are no labour-pains, and the mouth of the womb is not dilated, it is ſometimes very difficult to deliver, more eſpecially if the os internum is not a little lax, but feels rigid.

If the os uteri is ſo much contracted, that the finger cannot be introduced, ſome authors have recommended a dilator, by which it may be gradually opened ſo as to admit a finger or two. Doubtleſs, ſome caſes may happen, in which this may be neceſſary. If in ſtretching the os internum, labour-pains are brought on, let the operator ſlowly proceed and encourage them: when the mouth of the womb is opened, if the head preſents and the pains are ſtrong, by breaking the membranes the flooding will be diminiſhed; but, if ſhe floods to ſuch a degree as to be in danger of her life, and the dilatation does not bring on labour, at leaſt not enough for the occaſion, ſhe muſt be immediately delivered in the following manner: but in the firſt place let her friends be apprized of the danger, and the operator beware of promiſing to ſave either mother or child.

The operator having performed his duty in making the friends acquainted with the ſituation of the caſe, muſt gently open the os externum, by introducing his fingers gradually, turning them half round and puſhing upward; then forming them, with the thumb, into the figure of a wedge or cone, continue to dilate ſlowly and by intervals, until his hand is admitted into the vagina: having thus far gained his point, let him inſinuate, in the ſame ſlow cautious manner, firſt one, then two fingers, into the os internum, which may be dilated ſo as to admit the other two and the thumb in the ſame conical form, which will gradually make way for ſliding the hand along between the outſide of the membranes and inſide of the uterus; then he muſt manage as directed in the ſecond caſe: If, upon ſliding up his hand upon the outſide of the membranes, he feels the placenta adhering to that ſide of the womb, he muſt either withdraw that hand, and introduce the other on the oppoſite ſide, or break through the membranes at the lower edge of the placenta.

The greateſt danger in this caſe frequently proceeds from the ſudden emptying of the uterus and belly; for when labour comes on of itſelf, or is brought on in a regular manner, and the membranes are broke, the flooding is gradually diminiſhed, and firſt the child, then the placenta, is delivered by the pains; ſo that the preſſure or reſiſtance is not all at once removed from the belly and uterus of the woman, which have time to contract by degrees; conſequently, thoſe fainting fits and convulſions are prevented which often proceed from a ſudden removal of that compreſſion under which the circulation was performed.

The younger the woman is with child, the greater is the difficulty in opening the os internum; and more ſo in the firſt child, eſpecially if ſhe is paſt the age of thirty-five.

We ſhould never refuſe to deliver in theſe dangerous caſes, even although the patient ſeems expiring: for, immediately after delivery, the uterus contracts; the mouths of the veſſels are ſhut up, ſo that the flooding ceaſes; and ſhe may recover, if ſhe lives five or ſix hours after

after the operation, and can be supported by frequent draughts of broth, jelly, caudle, weak cordial, and anodyne medicines, which maintain the circulation, and gradually fill the empty veſſels.

If, in time of flooding, ſhe is ſeized with labour-pains, or if, by every now and then ſtretching with your fingers the os internum, you bring on labour, by which either the membranes or head of the child is puſhed down, and opens the os internum, the membranes ought to be broke; ſo that ſome of the waters being diſcharged, the uterus may contract and ſqueeze down the fœtus. This may be done ſooner in thoſe women who have had children formerly. If, notwithſtanding this expedient, the flooding ſtill continues, and the child is not like to be ſoon delivered, it muſt be turned immediately; or, if the head is in the pelvis, delivered with the forceps: but, if neither of theſe two methods will ſucceed, on account of the narrowneſs of the pelvis, or the bigneſs of the head, this laſt muſt be opened and delivered with the crotchet. In all theſe caſes, let the parts be dilated ſlowly and by intervals, in order to prevent laceration. See Plate CXI. fig. 4. 5. 6.

The third claſs of PRETERNATURAL LABOURS.

WE have already obſerved, that the principal difficulties in turning children and bringing them by the feet, proceeded from the contraction of the uterus and bad poſition of the fœtus. If the child lies in a round form, whether the fore-parts are towards the os internum, or up to the fundus uteri, we can, for the moſt part, move it with the hand, ſo as to turn the head and ſhoulders to the upper part, and the breech and legs downwards; but if the child lies lengthways, the womb being contracted around it, like a long ſheath, the taſk is more difficult; eſpecially, if the head and ſhoulders of the child are down at the loweſt part of the uterus, with the breech and feet turned up to the fundus.

The hand of the operator being introduced into the uterus, if he finds the breech below the head and ſhoulders, let him ſearch for the legs, and bring them down: but if the breech be higher than the upper parts of the child, or equal with them, he muſt try to turn the head and ſhoulders to the fundus, and the breech downwards, by puſhing up the firſt, and pulling down the laſt; then proceed with delivery as before directed. This is commonly executed with eaſe, provided ſome part of the waters ſtill remain in the uterus; but, if the woman has been long in labour, and the waters diſcharged, the contraction of the womb is ſo ſtrong, that the child cannot be turned without the exertion of great force frequently repeated. In this caſe, the eaſieſt method both for the patient and operator, is to puſh up the hand gradually on that ſide to which the legs and thighs are turned; and even after he has reached them, if they are not very high up, let him advance his hand as far as the fundus uteri; he will thus remove the greateſt obſtacle, by enlarging the cavity of the womb, ſo as more eaſily to feel and bring down the legs: then he may puſh up and pull down, as we have preſcribed above: but, if the head and ſhoulders ſtill continue to hinder the breech and body from coming along, and the feet cannot be brought ſo low, as the outſide of the os externum, while they are yet in the vagina he may apply a nooſe upon one or both; for unleſs the child is ſo ſmall that he can turn it round by graſping the body when the head and ſhoulders are puſhed up, and he endeavours to bring down the other part, they will again return to the ſame place, and retard delivery: whereas, if he gains a firm hold of the feet, either without the os externum, or in the vagina, by means of the nooſe fixed upon the ancles, he can with the other hand puſh up the head and ſhoulder, and be able in that manner to bring down the breech. He muſt continue this method of puſhing up and pulling down, until the head and ſhoulder are raiſed to the fundus uteri; for ſhould he leave off too ſoon, and withdraw his hand, although the child is extracted as far as the breech, the head is ſometimes ſo preſſed down and engaged with the body in the paſſage, that it cannot be brought farther down without being tore along with the crotchet; for the breech and part of the body may block up the paſſage in ſuch a manner, as that the hand cannot be introduced to raiſe the head.

Thoſe caſes are commonly the eaſieſt in which the fore-parts preſent, and the child lies in a round or oval form, acroſs the uterus, or diagonally, when the head or breech is above and over the os pubis, with the legs, arms, and navel-ſtring, or one or all of them, at the upper or lower part of the vagina, or on the outſide of the os externum. Thoſe are more difficult in which, though the child lies in the ſame round or contracted form, the back, ſhoulders, belly, or breaſt, are over the os internum; becauſe if we cannot move the child round, ſo as to place the head to the fundus, the legs are brought down with much more difficulty than in the other caſe: but if the ſhoulder, breaſt, neck, ear, face, or crown of the head preſents, and the legs and breech are up to the fundus uteri, the caſe is ſtill more difficult; becauſe, in the other two, the uterus is contracted in a round form, ſo that the wrong poſition of the child is more eaſily altered than in this, when the womb is contracted in a long ſhape, and ſometimes requires vaſt force to ſtretch it, ſo as that the head may be raiſed to the fundus, and the legs and breech brought down.

The crown of the head is the worſt part that can preſent, becauſe in that caſe the feet and breech are higher, and the uterus of a longer form than in any other. The preſentation of the face is, next to this, attended with the greateſt difficulty: but when the neck, ſhoulder, back, or breaſt preſent, the head is turned upwards, and keeps the lower part of the womb diſtended: ſo that, upon ſtretching the upper part, the child's head is more eaſily raiſed to the fundus.

When the fore-parts of the child preſent, if the feet, hands, and navel-ſtring are not detained above the os uteri, ſome or all of them deſcend into the vagina, or appear on the outſide of the os externum. If one or more of them come down, and the child at the ſame time lies in a round form acroſs the uterus, let the accoucheur introduce his hand between them and the ſacrum. When it is paſt the os internum, let it reſt a little, while he feels with his fingers the poſition of the fœtus: if the head and ſhoulders lie higher than the breech, he muſt take hold of the legs and bring them down withoutſide the os

internum

internum: if the breech is detained above the brim of the pelvis, let him slide up the flat of his hand along the buttocks, and pull down the legs with the other hand; by which method the breech is disengaged and forced into the middle of the pelvis. See Plate CXIII. fig. 3.

In most of those cases where the child is pressed in an oval form, if neither the head or breech present, the head is to one side of the uterus, and the breech to the other; because it is wider from side to side, than from the back to the fore part; and if either the head or breech is over the os pubis, the other is turned off to the side: in moving the head or shoulders to the fundus, they are raised with greater ease along the side, than at the back or fore parts, for the same reasons.

If the head and shoulders lie lower down, so as to hinder the breech from coming along, and the legs from being extracted, let him push up the head and shoulders to the fundus, and pull out the legs; then try to bring in the breech; and if it still sticks above, because the head and shoulders are again forced down by the contraction of the uterus, he must with one hand take hold of the legs that are now without the os externum, and, sliding the other into the uterus, push the head and shoulders again up to the fundus, while, at the same time, he pulls the legs and breech along with the feet. If the legs cannot be brought farther down than the vagina, because the breech is high up, let him slip a noose over the feet round the ancles, as before observed; by which he may pull down the lower parts with one hand, while the other is employed in pushing up, as before. By this double purchase, the child may be turned even in the most difficult cases: but the operator, in pulling, must beware of overstraining the ligaments of the joints.

If the legs can be extracted through the os externum, let a single cloth, warmed, be wrapped round them, in order to yield a firmer hold to the accoucheur; but when they can be brought no lower than the neck of the uterus and vagina, he may use one of these following nooses.

Let him take a strong limber fillet, or soft garter half-worn, about one yard and an half in length, and moderately broad and thick; if thick, an eye may be made at one end of it, by doubling about two inches and sewing it strongly; and the other end passed through this doubling, in order to make the noose; which being mounted upon the thumb and fingers of his hand, must be introduced, and gently slipped over the toes and feet of the child so as to embrace the ancles, and thus applied it must be drawn tight with his other hand.

If the foot or feet should be so slippery, that his fingers cannot hold them, and work over the noose at the same time, it must be withdrawn and mounted round his hand or wrist; with which hand, when introduced, he may take firm hold on both feet, if they are as far down as the vagina; then with the fingers of his other hand, he can slide the noose along the hand and fingers that hold the feet, and fix it round the ancle: but if one foot remains within the uterus, the fingers of his other hand cannot push up the noose far enough to slide it over the ancle; so that he must have recourse to a director, like that for polypuses, mounted with the noose, which will push it along the hand and fingers that hold the foot. The noose being thus slipped over the fingers upon the ancle, he must pull the extremity of the fillet which hath passed the eye at the upper end of the director, and after it is close drawn, bring down the instrument.

If the fillet or garter is too narrow or thin, let it be doubled in the middle, and the noose made by passing the two ends through the doubling.

When the belly presents, and the head, shoulders, breech, thighs, and legs, are turned up over the back to the fundus uteri; when the back presents, and all these parts are upwards; when the side presents, with the head, shoulders, breech, thighs and legs turned to the side, back, or fore part of the uterus: In all these cases, when the child is pressed into a round, or (more properly) an oval figure, it may be, for the most part, moved round, with one hand introduced into the uterus, the head and shoulders pushed to the fundus, and the legs and breech to the os internum; which being effected, the legs are easily brought down. See Plate CXIII. fig. 4. But these cases are more or less difficult as the feet are farther up, or lower down, because the business is to bring them downwards.

When the breast, shoulders, neck, ear, or face present to the os internum, the breech, thighs, and legs being towards the fundus, with the fore parts of the fœtus turned either to the side, back, or fore-part of the woman's belly; and the whole lying in a longish form, the uterus being closely contracted around its body like a sheath; let the accoucheur introduce his hand into the vagina, and open the os internum by pushing up the fingers and hand flattened between the parts that present and the inside of the membranes; and rest his hand in that situation, until he can distinguish how the child lies, and form a right judgment how to turn and deliver; for, if these circumstances are not maturely considered, he will begin to work in a confused manner, fatigue himself and the patient, and find great difficulty in turning and extracting the child.

If the feet and legs of the fœtus lie towards the back, sides, or fundus uteri, the woman ought to be laid on her back, with her breech raised and brought a little over the bed, as formerly observed; because, in that position he can more easily reach the feet than in any other.

If they lie towards the fore-part of the uterus, especially when the belly is pendulous, she ought to lie upon her side; because in the other posture, it is often difficult to turn the hand up to the fore-part of the womb; whereas, if she is laid on the left side, the right hand may be introduced at the upper part and left side of the brim of the pelvis, where it is widest, and then along the fore-part of the uterus, by which means the feet are more easily come at. If it is more convenient for the accoucheur to use his left hand, the patient may be turned on her right side. The only inconvenience attending these positions, is, that the woman cannot be kept so firm and steady, but will be apt to toss about and shrink from the operator: and besides, there may be a necessity for turning her upon her back, after the body is delivered, before he can extract the head, especially if it be large, or the pelvis narrow.

The situation of the child being known, and the position of

of the mother adjusted, let the proper hand be introduced, and the first effort always made in pushing the presenting part up towards the fundus, either along the sides, back, or fore part of the uters, as is most convenient. If this endeavour succeeds, and the breech, thighs, or legs come down, the body may be delivered with ease: but if the head, shoulder, breast, or neck present, the other parts of the body being stretched up lengthways, and the uterus so strongly contracted around the child, that the presenting part cannot be raised up, or, though pushed upwards, immediately returns before the legs can be properly seized or brought down; the operator ought, in that case, to force up his hand slowly and gradually between the uterus and the child: if the resistance is great, let him rest a little, between whiles, in order to save the strength of his hand and arm, and then proceed with his efforts until he shall advance his hand as far as the feet; for the higher his hand is pushed, the more will the uterus be stretched, and the more room granted for bringing the legs along: and if, in pushing up his hand, the fingers should be entangled in the navel-string or one of the arms, let him bring it a little lower, and pass it up again on the outside of such incumbrance.

The hand being advanced as high as the fundus, let him, after some pause, feel for the breech, slide his fingers along the thighs in search of the legs and feet; of which taking hold with his whole hand, if possible, let him bring them down either in a streight line or with a half turn: or should the contraction of the uterus be so strong, that he cannot take hold of them in that manner, let him seize one or both ancles between his fingers, and pull them along; but if he cannot bring them down to the lower part of the uterus, so as to apply the noose, he must try again to push up the body, in order still more to stretch the uterus, and obtain freer scope to bring them down lower: then he may apply the noose, and turn the child as above directed, until the head and shoulders are raised up to the fundus, and the feet and breech delivered.

If one leg only can be brought down, the child being turned, and that member extracted through the os externum, let the accoucher slide his hand up to fetch the other; but, if this cannot be done, he must fix a finger on the outside of the groin of that thigh which is folded up along the belly, and bring along that buttock, as in the breech case, while he pulls with his other hand at the other leg; and the body being thus advanced, deliver as before directed.

When the shoulder presents, and the arm lies double in the vagina, let him push them both up; but, if this cannot be done, and the hand is prevented from passing along, he must bring down the arm, and hold it with one hand, while the other is introduced; then let go and push up the shoulder, and as the child is turned, and the feet brought down, the arm will for the most part return into the uterus: but if the arm that is come down, be so much swelled, that it is impracticable to introduce the hand, so as to turn and deliver the child, he must separate it at the joint of the shoulder, if it be so low down; or at the elbow, if he cannot reach the shoulder. If the limb be much mortified, it may be twisted off; otherwise, it may be snipt and separated with the scissars.

If the shoulder, by the imprudence and ignorance of the unskilful, who pull, in expectation of delivering in that way, is forced into the vagina, and part of it appears on the outside of the os externum, a vast force is required to return it into the uterus; because, in this case, the shoulder, part of the ribs, breast, and side, are already pulled out of the uterus, which must be extended so as not only to receive them again, but also to admit the hand and arm of the accoucheur. If this distension cannot possibly be effected, he must fix a crotchet above the sternum, and turn the child by pushing up the shoulder and pulling down with the crotchet; or slide his fingers to the neck of the child, and with the scissars divide the head from the body; then deliver first the separated head, or bring along the body by pulling at the arm, or, if need be, with the assistance of the crotchet.

When the forehead, face, or ear presents, and cannot be altered with the hand into the natural position; or is not advanced to the os externum, so as that we can assist with the forceps; the head must be returned, and the child delivered by the feet: but if this cannot be done, and the woman is in imminent danger, recourse must be had to the crotchet.

If the navel-string comes down by the child's head, and the pulsation is felt in the arteries, there is a necessity for turning without loss of time; for unless the head advances fast, and the delivery is quick, the circulation in the vessels will be entirely obstructed, and the child consequently perish. If the head is low in the pelvis, the forceps may be successfully used.

No doubt, if the pelvis is very narrow, or the head too large, it would be wrong to turn: in that case, we ought to try if we can possibly raise the head, so as to reduce the funis above it, and after that let the labour go on: but, if the waters are all gone, and a large portion of the funis falls down, it is impossible to raise it, so as to keep it up, even although we could easily raise the head; because, as one part of the funis is pushed up with the fingers, another part falls down, and evades the reduction; and to raise it up to the side, and not above the head, will be to no purpose; when a little only jets down at the side of the head, our endeavours will, for the most part, be successful.

The ancients, as well as some of the moderns, advise, in all cases when the upper parts, such as the shoulders, breast, neck, face, or ear of the child present, to push them upwards, and bring in the head as in the natural way; observing, that the fœtus ought never to be delivered by the feet, except in the presentation of the lower parts, such as the small of the back, belly, side, breech, or legs. Were it practicable at all times to bring the head into the right position, a great deal of fatigue would be saved to the operator, much pain to the woman, and imminent danger to the child: he therefore ought to attempt this method, and may succeed when he is called before the membranes are broke, and feels, by the touch, that the face, ear, or any of the upper parts, presents; in that case, let him open the os externum slowly during every pain, and when the os internum is sufficiently dilated by the descent of the waters and membranes, let him introduce his hand into the uterus, as before directed, betwixt the womb and the membranes, which must be broke;

broke; and if he finds the head ſo large, or the pelvis ſo narrow, that it will be difficult to ſave the child; provided the woman is vigorous and has ſtrong pains, he may with little difficulty bring in the crown of the head, then withdraw his hand; and if the pains return and continue, the child has a good chance to be delivered alive. Even after the membranes are broke, if the preſenting part hath ſo locked up the os internum, as to detain ſome portion of the waters (a circumſtance eaſily known in puſhing up the part that preſents,) he may run up his hand ſpeedily to keep them from being diſcharged, and act in the ſame manner: but if the child is not large, nor the pelvis narrow, it were pity, while his hand is in the uterus, to deſiſt from turning the child and bringing it by the feet; becauſe, in that caſe, he may be pretty certain of ſaving it. Beſides, after the head is brought into the right poſition, ſhould the pains go off entirely, (and this frequently happens,) or a flooding come one, in conſequence of the force which hath been exerted, he will find great difficulty in turning after the waters have been diſcharged; for, it is harder to turn when the vertex preſents, than in any other poſition; whereas, in the caſe of a large head or narrow pelvis, when the head is forced down by the labour-pains, and will not farther advance, the child may be ſaved by the forceps; nay, though the pains do not act ſo as to force it down, to be delivered either by the forceps or in the natural way, the head may be opened and extracted with the crotchet, which is the laſt reſource.

But this neceſſity ſeldom occurs, becauſe the caſes in which we are moſt commonly called, are after the membranes have been long broke, the waters diſcharged, and the uterus ſtrongly contracted around the body of the child, which it confines, as it were, in a mould: ſo that it is next to impoſſible to bring the head into the natural poſition; for this cannot be effected without firſt puſhing up the part that preſents, for which purpoſe great force is required; and as one hand only can be introduced, when the operator endeavours to bring in the head, the puſhing force is abated, to allow the pulling force to act; and the parts that hindered the head from preſenting are again forced down: beſides, the head is ſo large and ſlippery, that he can obtain no firm hold. He might, indeed, by introducing a finger into the mouth, lay hold of the under jaw, and bring in the face, provided the ſhoulder preſents; but, inſtead of amending, this would make the caſe worſe, unleſs the child be very ſmall: yet, granting the head could be brought into the natural poſition, the force neceſſarily exerted for this purpoſe would produce a flooding, which commonly weakens the patient, and carries off the pains; and after all, he muſt turn with leſs advantage: and if that cannot be performed when the head is brought in, he muſt have recourſe to the laſt and moſt diſagreeable method; whereas when any other part preſents, we can always turn the child, and deliver it by the feet. This we cannot promiſe after the head is brought in; and once the operator's hand is in the uterus, he ought not to run ſuch riſks.

The child is often in danger, and ſometimes loſt, when the breech preſents, and is low down in the pelvis, provided the thighs are ſo ſtrongly preſſed againſt the funis and belly, as to ſtop the circulation in the rope; as alſo when the child is detained by th head, after the body is delivered: in both caſes, the danger muſt be obviated by an expeditious delivery; and if the body is entangled in the navel-ſtring, it muſt be diſengaged as well as poſſible, eſpecially when the funis happens to be between the thighs.

The legs and breech of the child being brought down, and the body properly turned with the fore-parts to the mother's back, let the accoucheur endeavour to bring it along; but, if it is detained by the ſize of the belly, diſtended with air or water, (a caſe that frequently happens when the child has been dead for ſeveral days,) let the belly be opened, by forcing into it the points of his ſciſſars; or, he may tear it open with the ſharp crotchet.

The body of the child being delivered, the arms brought down, and every method hitherto directed unſucceſsfully uſed for the extraction of the head, which is detained by being naturally too large, over oſſified, or dropſical, or from the narrowneſs and diſtortion of the pelvis; if the belly was not opened, and the child is found to be alive by the motion of the heart, or pulſation of the arteries in the funis, the forceps ought to be tried; but, if he finds it impracticable to deliver the head, ſo as to ſave the life of the child, he muſt, according to ſome, force the points of the ſciſſars through the lower part of the occipital bone, or through the foramen magnum; then dilate the blades, ſo as to enlarge the opening, and introduce a blunt or ſharp hook. This operation rarely ſucceeds when the head is over-oſſified; but may anſwer the purpoſe when the bones are ſoft and yielding; or in the caſe of an hydrocephalus: becauſe, in the firſt, the aperture may ſometimes be enlarged, and in the other the water will be evacuated ſo as to diminiſh the bulk of the head, which will, of conſequence, come along with more eaſe.

If, notwithſtanding theſe endeavours, the head cannot be extracted, let the operator introduce his hand along the head, and his fingers through the os uteri; then ſlide up one of the curved crotchets along the ear, betwixt his hand and the child's head, upon the upper part of which it muſt be fixed: this being done, let him withdraw his hand, take hold of the inſtrument with one hand, turning the curve of it over the forehead, and with the other graſp the neck and ſhoulders, then pull along. The crotchet being thus fixed on the upper part, where the bones are thin and yielding, makes a large opening, through which the contents of the ſkull are emptied, the head collapſing is with more certainty extracted, and the inſtrument hath a firm hold to the laſt, at the forehead, os petroſum, and baſis of the ſkull.

The excellency of *Meſnard*'s contrivance is more conſpicuous here than when the head preſents; becauſe the curvature of the crotchet allows the point to be fixed on the upper part of the ſkull, which is to be tore open; and in pulling, the contents are evacuated, and the head is leſſened: by theſe means, the principal obſtruction is removed. See Plate CXIII. fig. 8.

a, Repreſents a pair of curved crotchets locked together in the ſame manner as the forceps. The dotted lines along the inſide of one of the blades repreſent a ſheath contrived to guard the point till it is introduced

duced high enough; the ligature at the handles marked with the two dotted lines is then to be untied, the sheath withdrawn, and the point, being uncovered, is fixed as in Plate CXIII. fig. 5.

b, Gives a view of the back part of one of the crotchets, which is 12 inches long.

c, A front view of the point, to shew its proportional length and breadth.

d, The sciſſars for perforating the cranium in very narrow and diſtorted pelvis's. They ought to be made very ſtrong, and at leaſt nine inches in length, with ſtops or reſts in the middle of the blades, by which a large dilatation is more eaſily made.

If one crotchet be found inſufficient, let him introduce the other in the ſame manner, along the oppoſite ſide, lock and join them together, and pull along, moving and turning the head, ſo as to humour the ſhape of the pelvis. This method ſeldom fails to accompliſh his aim, though ſometimes very great force is required; in which caſe, he muſt pull with leiſure and caution.

But if all theſe expedients ſhould fail, by reaſon of the extraordinary oſſification or ſize of the head, or the narrowneſs and diſtortion of the pelvis, after having uſed the crotchets without ſucceſs, he muſt ſeparate the body from the head with a biſtory or pair of ſciſſars; then puſhing up the head into the uterus, turn the face to the fundus, and the vertex down to the os internum and brim of the pelvis: let him direct an aſſiſtant to preſs upon the woman's belly with both hands, in order to keep the uterus and head firm in that poſition; then open the ſkull with the ſciſſars, deſtroy the ſtructure of the brain, and extract with the crotchets.

The head is ſometimes left in the uterus by thoſe practitioners, who not knowing how to turn the fore-parts and face of the child towards the back part of the uterus, or how to bring it along, although it preſented in that poſition, pull at random with all their ſtrength; ſo that the neck is ſtretched and ſeparated, and the head left behind. This may alſo happen to an expert accoucheur, when the child hath been dead for many days, and the body is much mortified, even though he hath uſed all the neceſſary precautions.

In ſuch a caſe, provided the head is not very large, nor the pelvis narrow, and the forehead is towards the ſacrum, let him ſlide up his hand along the back-part of the pelvis, and introducing two fingers into the mouth, with the thumb below the chin, try to pull the forehead into the hollow of the ſacrum: if it ſticks at the jetting-in of that bone, he muſt endeavour to move it, firſt to one ſide, and then to the other. If the head is ſmall, it will come along; if any fragment of the neck remains, or any part of the looſe ſkin, he may lay hold on it, and aſſiſt delivery, by pulling at it with his other hand; if the head is low down, it may be extracted with the forceps.

Should all theſe methods fail, let him puſh up his hand along the ſide of the head, until it ſhall have paſſed the os internum; with the other hand, let him introduce one of the curved crotchets, and fix it upon the upper part of the head; then withdrawing the hand which was introduced, take hold on the inſtrument, and ſliding the fingers of the other hand into the mouth, he muſt pull down with both, as above directed. If the head is not over-oſſified, the crotchet will tear open the ſkull; and the bulk being of conſequence diminiſhed, the whole may be brought along, even in a narrow pelvis: but if it cannot be moved, even by this expedient, he muſt introduce the other crotchet along the other ſide of the head, and fixing it upon the ſkull, lock them together; then in pulling, turn the fore-head down into the hollow of the ſacrum, and extract with an half round turn upwards, as when delivering with the forceps.

If the forehead is towards the os pubis, and cannot be brought into the right poſition, let him with his hand puſh up the head into the uterus, turn the forehead from the anterior to the ſide or back part of it, and try to extract as before. If the child hath been dead ſome time, and is much mortified, he muſt pull cautiouſly at the under jaw, becauſe, ſhould that give way, he will have no other hold for pulling, or keeping the head ſteady when he attempts to extract with one crotchet.

When the head is ſo large, or the pelvis ſo narrow, that none of theſe methods will ſucceed, let him puſh up, and turning the upper parts downwards, direct an aſſiſtant to preſs the patient's belly with both hands, moving them from ſide to ſide, and ſqueezing in ſuch a direction as will force the head towards the os internum, and retain it firmly in that poſition; then it muſt be opened and extracted.

Although, by theſe means, you may ſucceed in a few caſes of this kind, yet as great difficulties may occur from inflammations of the pudenda, contraction of the uterus, ſlipperineſs or largeneſs of the head, and the narrowneſs of the pelvis, it will not be improper to inform the reader of other methods that appear to be uſeful. Let the hand be introduced into the vagina, and if it cannot be admitted within the uterus, the fingers being inſinuated, may move the head ſo as to raiſe the face and chin to the fundus, the vertex being turned to the os internum, and the forehead towards the ſide of the ſacrum. This being effected, let the operator ſlide up along one ear a blade of the long forceps, which are curved to the ſide; then change hands, and ſend up the other blade along the oppoſite ear: when they are locked, and the handles ſecured by a fillet, he muſt pull the head as low as it will come; then putting them into the hands of an aſſiſtant, who will keep them in that poſition, let him make a large opening with the ſciſſars, ſqueeze the head with great force, and extract ſlowly and by degrees.

Having turned down the vertex, as above directed, let *Leverot*'s tire-tête, with the three ſides joined together, be introduced along the accoucheur's hand to the upper part of the head; then let the ſides or blades be opened with the other hand, ſo as to incloſe the head, moving them circularly and lengthwiſe in a light and eaſy manner, that they may paſs over the inequalities of the ſcalp, and avoid the reſiſtance of the head and uterus: when they are exactly placed at equal diſtances from one another, let him join the handles, withdraw his hand, and tying them together with a fillet, pull down, open, and extract, as above directed; and let it be remembered, that the farther the hand can be introduced into the uterus, the more eaſily will both inſtruments be managed.

When

When the pelvis is large, or the head ſmall, (in which caſes this misfortune ſeldom happens,) without doubt we might ſucceed with *Mauriceau*'s broad fillet or ſling, provided it could be properly applied,

When the head is ſmall, or the pelvis large, dilating the forámen magnum with the ſciſſars, and introducing the blunt hook, may be of uſe either to pull the head along, or keep it down until we can fix the forceps, curve crotchet, or *Leveret*'s tire-tête.

Of Twins.

Twins are ſuppoſed to be the effect of a double conception in one coition, when two or more ova are impregnated with as many animalcula; which deſcending from the ovarium, through the Fallopian tube, into the fundus uteri, as they increaſe, come in contact with that part, and with one another, and are ſo preſſed as to form one globular figure, and ſtretch the womb into the ſame form which it aſſumes when diſtended by one ovum only; and that during the whole term of uterine geſtation, it is impoſſible to diſtinguiſh twins, either by the figure and magnitude of the uterus, or by the motion of the different fœtuſſes; for one child, when it is large, and ſurrounded with a great quantity of waters, will ſometimes produce as large a prominence (or even larger) in the woman's belly, than is commonly obſerved when ſhe is big with twins. One child will alſo, by moving its legs, arms, and other parts of its body, againſt different parts of the uterus, at the ſame inſtant, or by intervals, yield the ſame ſenſation to the mother, as may be obſerved in two or more children; for part of the motion in twins is employed on each other, as well as upon the uterus.

There is therefore no certain method of diſtinguiſhing in theſe caſes, until the firſt child is delivered, and the accoucheur has examined if the placenta is coming along. If this comes of itſelf, and after its extraction the mouth of the womb be felt contracted, and the operator is unwilling to give unneceſſary pain by introducing his hand into the uterus; let him lay his hand upon the woman's abdomen, and if nothing is left in the womb, he will generally feel it juſt above the os pubis, contracted into a firm round ball of the ſize of a child's head, or leſs: whereas, if there is another child left, the ſize will be found much larger. If the placenta does not come down before the ſecond child, which is frequently the caſe, upon examining, he will commonly feel the membranes with the waters puſhed down through the os uteri; or, if they are broke, the head or ſome part of the body will be felt. If, therefore, the woman has ſtrong pains, and is in no danger from floodings or weakneſs, provided the head preſents fair, and ſeems to come along, ſhe will be delivered of this alſo in the natural way.

If the membranes are not broke, if the head does not immediately follow, or if the child preſents wrong, he ought to turn and bring it immediately by the feet; in order to ſave the patient the fatigue of a ſecond labour, that may prove tedious, and even dangerous, by enfeebling her too much. Beſides, as the parts are fully opened by the firſt delivery, he can introduce his hand with eaſe; and as the membranes are, for the moſt part, whole, the waters may be kept up, and the fœtus eaſily turned; but, if the pelvis is narrow, the woman ſtrong, and the head preſents, he ought to leave it to the efforts of nature.

If the child preſents wrong, and, in turning that, he feels another, he muſt beware of breaking the membranes of one, while he is at work upon the other: but, ſhould they chance to be broke, and the legs of both entangled together, (though this is ſeldom the caſe, becauſe they are commonly divided by two ſets of membranes,) let the operator, when he has got hold on two legs, run up his fingers to the breech, and feel if they belong to the ſame body; and one child being delivered, let the other be turned and brought out in the ſame manner. If there are more than two, the ſame method muſt take place, in extracting one after another.

In caſe of twins, the placenta of the firſt ſeldom comes along, until the ſecond child is delivered; but, as this does not always happen, he ought, as formerly directed, to certify himſelf that there is nothing left in the uterus, when the cake comes of itſelf. Both children deing delivered, let him extract both placentas, if they come not of themſelves; and if they form diſtinct cakes, ſeparate firſt one, then the other; but if they are joined together, forming but one maſs, they may be delivered at once.

When there are three or four children, (a caſe that rarely happens,) the placentas are ſometimes diſtinct, and ſometimes all together form but one round cake; but, when this is macerated in water for ſome days, they, with their ſeveral membranes, may be eaſily ſeparated from one another; for they only adhere in conſequence of their long preſſure in the uterus, and ſeldom have any communication of veſſels.

Twins for the moſt part lie diagonally in the uterus, one below the other; ſo that they ſeldom obſtruct one another at the os internum. See Plate CXI. fig. 5.

Of Monsters.

Two children joined together by their bellies, (which is the moſt common caſe of monſtrous births,) or by the ſides, or when the belly of the one adheres to the back of the other, having commonly but one funis, are comprehended in this claſs, and ſuppoſed to be the effect of two animalcula impregnating the ſame ovum, in which they grow together, and are nouriſhed by one navel-ſtring, originally belonging to the ſecundines; becauſe, the veſſels pertaining to the coats of the vein and arteries, do not anaſtomoſe with the veſſels belonging to the fœtus.

In ſuch a caſe, where the children were ſmall, the adheſion hath been known to ſtretch in pulling at the feet of one, ſo as to be delivered; and the other hath been afterwards brought along, in the ſame manner, without the neceſſity of a ſeparation.

When the accoucheur is called to a caſe of this kind, if the children are large, and the woman come to her full time, let him firſt attempt to deliver them by that method: but if, after the legs and part of the body of the firſt are brought down, the reſt will not follow, let him ſlide up his hand, and with his fingers examine the adheſion; then introducing the ſciſſars between his hand and the body of the fœtus, endeavour to ſeparate them by

ſnipping through the juncture. Should this attempt fail, he muſt diminiſh the bulk in the beſt manner he can think of, and bring the body of the firſt, in different pieces, by pulling or cutting them aſunder; as he extracts with the help of the crotchet.

No certain rules can be laid down in theſe caſes, which ſeldom happen; and therefore a great deal muſt be left to the judgment and ſagacity of the operator, who muſt regulate his conduct according to the circumſtances of the caſe, and according to the directions given for delivering, when the pelvis is narrow and the children extraordinary large.

Of the CÆSARIAN OPERATION.

WHEN a woman cannot be delivered by any of the methods hitherto deſcribed and recommended in laborious and preternatural labours; on account of the narrowneſs or diſtortion of the pelvis, into which it is ſometimes impoſſible to introduce the hand; or from large excreſcences and glandular ſwellings, that fill up the vagina, and cannot be removed; or from large cicatrices and adheſions in that part, and at the os uteri, which cannot be ſeparated; in ſuch emergencies, if the woman is ſtrong, and of a good habit of body, the Cæſarian operation is certainly adviſeable, and ought to be performed; becauſe the mother and child have no other chance to be ſaved, and it is better to have recourſe to an operation which hath ſometimes ſucceeded, than leave them both to inevitable death. Nevertheleſs, if the woman is weak, exhauſted with fruitleſs labour, violent floodings, or any other evacuation, which renders her recovery doubtful, even if ſhe were delivered in the natural way: in theſe circumſtances it would be raſhneſs and preſumption to attempt an operation of this kind, which ought to be delayed until the woman expires, and then immediately performed, with a view to ſave the child.

The operation hath been performed both in this and the laſt century, and ſometimes with ſuch ſucceſs, that the mother has recovered, and the child ſurvived. The previous ſteps to be taken, are to ſtrengthen the patient, if weak, with nouriſhing broths and cordials; to evacuate the indurated fæces with repeated glyſters; and, if the bladder is diſtended with urine, to draw it off with a catheter. Theſe precautions being taken, ſhe muſt be laid on her back, on a couch or bed, her ſide on which the inciſion is to be made being raiſed up by pillows placed below the oppoſite ſide: the operation may be performed on either ſide, though the left is commonly preferred to the right; becauſe, in this laſt, the liver extends lower. The apparatus conſiſts of a biſtory, probe-ſciſſars, large needles threaded, ſpunges, warm water, pledgets, a large tent or doſſil, compreſſes, and a bandage for the belly.

If the weather is cold, the patient muſt be kept warm, and no part of the belly uncovered, except that on which the inciſion is to be made: if the operator be a young practitioner, the place may be marked by drawing a line along the middle ſpace between the navel and the os ilium, about ſix or ſeven inches in length, ſlanting forwards towards the left groin, and beginning as high as the navel.

According to this direction, let him hold the ſkin of the abdomen tenſe between the finger and thumb of one hand, and, with the biſtory in the other, make a longitudinal inciſion through the cutis, to the membrana adipoſa, which, with the muſcles, muſt be ſlowly diſſected and ſeparated, until he reaches the peritonæum, which muſt be divided very cautiouſly, for fear of wounding the inteſtines that frequently ſtart up at the ſides, eſpecially if the membranes are broke, the waters diſcharged, and the uterus contracted.

The peritonæum being laid bare, it may either be pinched up by the fingers, or ſlowly diſſected with the biſtory, until an opening is made ſufficient to admit the fore-finger, which muſt be introduced as a director for the biſtory or ſciſſars in making an effectual dilatation. If the inteſtines puſh out, let them be preſſed downwards, ſo as that the uterus may come in contact with the opening. If the womb is ſtill diſtended with the waters, and at ſome diſtance from the child, the operator may make upon it a longitudinal inciſion at once; but if it is contracted cloſe round the body of the fœtus, he muſt pinch it up, and dilate in the ſame cautious manner practiſed upon the peritonæum, taking care to avoid wounding the Fallopian tubes, ligaments, and bladder: then introducing his hand, he may take out the child and ſecundines. If the woman is ſtrong, the uterus immediately contracts, ſo as that the opening, which at firſt extended to about ſix or ſeven inches, is reduced to two, or leſs; and in conſequence of this contraction, the veſſels being ſhrunk up, a great effuſion of blood is prevented.

The coagulated blood being removed, and what is ſtill fluid ſpunged up, the inciſion in the abdomen muſt be ſtitched with the interrupted ſuture, and ſufficient room left between the laſt ſtitch and the lower end of the opening, for the diſcharge of the moiſture and extravaſated fluid. The wound may be dreſſed with dry pledgits or doſſils dipped in ſome liquid balſam warmed, covered with compreſſes moiſtened with wine, and a bandage to keep on the dreſſings and ſuſtain the belly. Some authors obſerve, that the cutis and muſcles only ſhould be taken up in the ſuture, leſt bad ſymptoms ſhould ariſe from ſtitching the peritonæum.

The woman muſt be kept in bed, as quiet as poſſible, and every thing adminiſtered to promote the lochia, perſpiration, and ſleep: which will prevent a fever and other dangerous ſymptoms. If ſhe hath loſt a great quantity of blood from the wounds in the uterus and abdomen, ſo as to be in danger from inanition, broths, caudles, and wine, ought to be given in ſmall quantities, and frequently repeated; and the Peruvian bark adminiſtered in powder, decoction, or extract, may be of great ſervice in this caſe.

Of the management of women from the time of their delivery to the end of the month, with the ſeveral diſeaſes to which they are ſubject during that period.

Of the EXTERNAL APPLICATION.

THE woman being delivered of the child and placenta, let a ſoft linen cloth, warmed, be applied to the external parts; and if ſhe complains much of a ſmarting ſoreneſs, ſome pomatum may be ſpread upon it. The linen that

that was laid below her, to ſpunge up the diſcharges, muſt be removed, and replaced with others that are clean, dry, and warm. Let her lie on her back, with her legs extended cloſe to each other; or upon her ſide, if ſhe thinks ſhe can lie eaſier in that poſition, until ſhe recovers from the fatigue: if ſhe is ſpent and exhauſted, let her take a little warm wine or caudle, or, according to the common cuſtom, ſome nutmeg and ſugar grated together in a ſpoon: the principal deſign of adminiſtring this powder, which among the good women is ſeldom neglected, is to ſupply the want of ſome cordial draught, when the patient is too weak to be raiſed, or ſuppoſed to be in danger of reachings from her ſtomach's being overloaded. When ſhe hath in ſome meaſure recovered her ſtrength and ſpirits, let the cloths be removed from the parts, and others applied in their room; and, if there is a large diſcharge from the uterus, let the wet linen below her be alſo ſhifted, that ſhe may not run the riſque of catching cold.

When the patient is either weak or faintiſh, ſhe ought not to be taken out of bed, or even raiſed up to have her head and body ſhifted, until ſhe is a little recruited; otherwiſe ſhe will be in danger of repeated faintings, attended with convulſions, which ſometimes end in death. To prevent theſe bad conſequences, her ſkirt and petticoats ought to be looſened and pulled down over the legs, and replaced by another well warmed, with a broad head-band to be ſlipt in below, and brought up over her thighs and hips: a warm double cloth muſt be laid on the belly, which is to be ſurrounded by the head band of the ſkirt pinned moderately tight over the cloth, in order to compreſs the viſcera and the relaxed parietes of the abdomen, more or leſs, as the woman can eaſily bear it; by which means the uterus is kept firm in the lower part of the abdomen, and prevented from rolling from ſide to ſide when the patient is turned: but the principal end of this compreſſion, is to hinder too great a quantity of blood from ruſhing into the relaxed veſſels of the abdominal contents; eſpecially when the uterus is emptied all of a ſudden, by a quick delivery. The preſſure being thus ſuddenly removed, the head is all at once robbed of its proportion of blood, and the immediate revulſion precipitates the patient into dangerous lypothymia.

For this reaſon the belly ought to be firmly compreſſed by the hands of an aſſiſtant, until the bandage is applied; or, in lieu of it, a long towel, ſheet, or roller, to make a ſuitable compreſſion: but, for this purpoſe, different methods are uſed in different countries, or according to the different circumſtances of the patients. The head-cloaths and ſhift ought alſo to be changed, becauſe with ſweating in time of labour they are rendered wet and diſagreeable. Several other applications are neceſſary, when the external or internal parts are rent or inflamed, misfortunes that ſometimes happen in laborious and preternatural caſes. See Medicine, p. 165, 166.

Of Air, Diet, Sleeping and Watching, Motion and Reſt, Retention and Excretion, and the Paſſions of the Mind.

Although we cannot remove the patient immediately after delivery into another climate, we can qualify the air, ſo as to keep it in a moderate and ſalutary temper, by rendering it warm or cold, moiſt or dry, according to the circumſtances of the occaſion. With regard to diet, women in time of labour, and even till the ninth day after delivery, ought to eat little ſolid food, and none at all during the firſt five or ſeven: let them drink plentifully of warm diluting fluids, ſuch as barley water, gruel, chicken-water, and teas; caudles are alſo commonly uſed, compoſed of water gruel boiled up with mace and cinnamon, to which, when ſtrained, is added a third or fourth part of white wine, or leſs, if the patient drinks plentifully, ſweetened with ſugar to their taſte: this compoſition is termed white caudle; whereas, if ale is uſed inſtead of wine, it goes under the name of brown caudle. In ſome countries, eggs are added to both kinds; but, in that caſe, the woman is not permitted to eat meat or broths till after the fifth or ſeventh day: in this country, however, as eggs are no part of the ingredients, the patient is indulged with weak broth ſooner, and ſometimes allowed to eat a little boiled chicken. But all theſe different preparations are to be preſcribed weaker or ſtronger, with regard to the ſpices, wine, or ale, according to the different conſtitutions and ſituations of different patients: for example, if ſhe is low and weak, in conſequence of an extraordinary diſcharge of any kind, either before or after delivery, or if the weather is cold, the caudles and broths may be made the ſtronger; but if ſhe is of a full habit of body, and has the leaſt tendency to a fever, or if the ſeaſon is exceſſively hot, theſe drinks ought to be of a very weak conſiſtence, or the patient reſtricted to gruel, tea, barley and chicken water, and theſe varied according to the emergency of the caſe.

Her food muſt be light and eaſy of digeſtion, ſuch as panada, biſcuit, and ſago; about the fifth or ſeventh day ſhe may eat a little boiled chicken, or the lighteſt kind of young meat: but, theſe laſt may be given ſooner or later, according to the circumſtances of the caſe, and the appetite of the patient. In the regimen as to eating and drinking, we ſhould rather err on the abſtemious ſide, than indulge the woman with meat and ſtrong fermented liquors, even if theſe laſt ſhould be moſt agreeable to her palate: for we find by experience, that they are apt to increaſe or bring on fevers, and that the moſt nouriſhing and ſalutary diet is that which we have above preſcribed. Every thing that is difficult of digeſtion, or quickens the circulating fluids, muſt of neceſſity promote a fever; by which, the neceſſary diſcharges are obſtructed, and the patient's life endangered.

As to the article of ſleeping and watching, the patient muſt be kept as free from noiſe as poſſible, by covering the floors and ſtairs with carpets and cloths, oiling the hinges of the doors, ſilencing the bells, tying up the knockers, and in noiſy ſtreets ſtrowing the pavement with ſtraw; if, notwithſtanding theſe precautions, ſhe is diſturbed, her ears muſt be ſtuffed with cotton, and opiates adminiſtred to procure ſleep; becauſe watching makes her reſtleſs, prevents perſpiration, and promotes a fever.

Motion and reſt are another part of the nonnaturals to which we ought to pay particular regard. By toſſing about, getting out of bed, or ſitting up too long, the perſpiration is diſcouraged and interrupted; and in this laſt

attitude the uterus, not yet fully contracted, hangs down, ſtretching the ligaments, occaſſioning pain, cold ſhiverings, and a fever: for the prevention of theſe bad ſymptoms, the patient muſt be kept quiet in bed till after the fourth or fifth day, and then be gently lifted up in the bed-cloaths, in a lying poſture, until the bed can be adjuſted, into which ſhe muſt be immediately re-conveyed, there to continue for the moſt part, till the ninth day, after which period women are not ſo ſubject to fevers, as immediately after delivery. Some there are, who, from the nature of their conſtitutions, or other accidents, recover more ſlowly; and ſuch are to be treated with the ſame caution after, as before, the ninth day, as the caſe ſeems to indicate: others get up, walk about, and recover, in a much ſhorter time; but theſe may ſome time or other pay dearly for their foolhardineſs, by encouraging dangerous fevers: ſo that we ought rather to err on the ſafe ſide, than run any riſque whatſoever.

What next comes under conſideration, is the circumſtance of retention and excretion. We have formerly obſerved, that in time of labour, before the head of the child is locked into the pelvis, if the woman has not had eaſy paſſage in her belly that ſame day, the rectum and colon ought to be emptied by a glyſter, which will aſſiſt the labour, prevent the diſagreeable excretion of the fœces before the child's head, and enable the patient to remain two or three days after, without the neceſſity of going to ſtool. However, ſhould this precaution be neglected, and the patient very coſtive after delivery, we muſt beware of throwing up ſtimulating glyſters, or adminiſtring ſtrong cathartics, leſt they ſhould bring on too many looſe ſtools, which, if they cannot be ſtopt, ſometimes produce fatal conſequences, by obſtructing the perſpiration and lochia, and exhauſting the woman, ſo as that ſhe will die all of a ſudden; a cataſtrophe which hath frequently happened from this practice. Wherefore, if it be neceſſary to empty the inteſtines, we ought to preſcribe nothing but emollient glyſters, or ſome very gentle opener, ſuch as manna, or *Elect. Lenitivum*. But no excretion is of more conſequence to the patient's recovery, than a free perſpiration; which is ſo abſolutely neceſſary, that unleſs ſhe has a moiſture continually on the ſurface of her body, for ſome days after the birth, ſhe ſeldom recovers to advantage: her health, therefore, in a great meaſure depends upon her enjoying undiſturbed repoſe, and a conſtant breathing ſweat, which prevents a fever, by carrying off the tenſion, and aſſiſts the equal diſcharge of the lochia: and when theſe are obſtructed, and a fever enſues with pain and reſtleſſneſs, nothing relieves the patient ſo effectually as reſt and profuſe ſweating, procured by opiates and ſudorifics at the beginning of the complaints; yet theſe laſt muſt be more cautiouſly preſcribed in exceſſive hot than in cool weather.

The laſt of the nonnaturals to be conſidered are the paſſions of the mind, which alſo require particular attention. The patient's imagination muſt not be diſturbed by the news of any extraordinary accident which may have happened to her family or friends: for ſuch information hath been known to carry off the labour-pains entirely, after they were begun, and the woman has ſunk under her dejection of ſpirits: and even after delivery, theſe unſeaſonable communications have produced ſuch anxiety as obſtructed all the neceſſary excretions, and brought on a violent fever and convulſions, that ended in death.

Of violent FLOODINGS.

ALL women, when the placenta ſeparates, and after it is delivered, loſe more or leſs red blood, from the quantity of half a pound, to that of one pound, or even two; but ſhould it exceed this proportion, and continue to flow without diminution, the patient is in great danger of her life: this hazardous hæmorrhage is known by the violence of the diſcharge, wetting freſh cloths as faſt as they can be applied; from the pulſe becoming low and weak, and the countenance turning pale; then the extremities grow cold, ſhe ſinks into faintings, and, if the diſcharge is not ſpeedily ſtopt, or diminiſhed, is ſeized with convulſions, which often terminate in death.

This dangerous efflux is occaſioned by every thing that hinders the emptied uterus from contracting, ſuch as great weakneſs and laſſitude, in conſequence of repeated floodings before delivery; the ſudden evacuation of the uterus; ſometimes, though ſeldom, it proceeds from part of the placenta's being left in the womb; it may happen when there is another child, or more, ſtill undelivered; when the womb is kept diſtended with a large quantity of coagulated blood; or when it is inverted, by pulling too forcibly at the placenta.

In this caſe, as there is no time to be loſt, and internal medicines cannot act ſo ſuddenly as to anſwer the purpoſe, we muſt have immediate recourſe to external application. If the diſorder be owing to weakneſs, by which the uterus is diſabled from contracting itſelf, ſo that the mouths of the veſſels are left open; or, though contracted a little, yet not enough to reſtrain the hæmorrhage of the thin blood; or if, in ſeparating the placenta, the accoucheur has ſcratched or tore the inner ſurface or membrane of the womb; in theſe caſes, ſuch things muſt be uſed as will aſſiſt the contractile power of the uterus, and hinder the blood from flowing ſo faſt into it and the neighbouring veſſels; for this purpoſe, cloths dipped in any cold aſtringent fluid, ſuch as oxycrate, or red tart wine, may be applied to the back and belly. Some preſcribe venæſection in the arm, to the amount of five or ſix ounces, with a view of making revulſion: if the pulſe is ſtrong, this may be proper; otherwiſe, it will do more harm than good. Others order ligatures, for compreſſing the returning veins at the hams, arms, and neck, to retain as much blood as poſſible in the extremities and head. Beſides theſe applications, the vagina may be filled with tow or linen rags, dipped in the above-mentioned liquids, in which a little allum, or ſachar-ſaturni hath been diſſolved: nay, ſome practitioners inject proof-ſpirits warmed, or, ſoaking them up in a rag or ſpunge, introduce and ſqueeze them into the uterus, in order to conſtringe the veſſels.

If the flooding proceeds from another child, the retention of the placenta, or coagulated blood, theſe ought immediately to be extracted; and if there is an inverſion of the uterus, it muſt be ſpeedily reduced. Should the hæmorrhage, by theſe methods abate a little, but ſtill continue to flow, though not in ſuch a quantity as to bring on ſudden death, ſome red wine and jelly ought to be

be prefcribed for the patient, who fhould take it frequently, and a little at a time; but above all things, chicken or mutton broths, adminiftered in the fame manner, for fear of overloading the weakened ftomach, and occafioning reachings: thefe repeated in fmall quantities, will gradually fill the exhaufted veffels, and keep up the circulation. If the pulfe continues ftrong, it will be proper to order repeated draughts of barley-water, acidulated with elixir vitriol: but if the circulation be weak and languid, extract of the bark, diffolved in *aq. cinnamomi tenuis*, and given in fmall draughts, or exhibited in any other form, will be ferviceable; at the fame time, lulling the patient to reft with opiates. Thefe, indeed, when the firft violence of the flood is abated, if properly and cautioufly ufed, are generally more effectual than any other medicine.

Of the AFTER-PAINS.

AFTER-PAINS commonly happen when the fibrous part of the blood is retained in the uterus or vagina, and formed into large clots, which are detained by the fudden contraction of the os internum and externum, after the placenta is delivered: or, if thefe fhould be extracted, others will fometimes be formed, though not fo large as the firft, becaufe the cavity of the womb is continually diminifhing after the birth. The uterus, in contracting, preffes down thefe coagulums to the os internum; which being again gradually ftretched, produces a degree of labour pains, owing to the irritation of its nerves: in confequence of this uneafinefs, the woman fqueezes the womb as in real labour; the force being increafed, the clots are pufhed along, and when they are delivered, fhe grows eafy. The larger the quantity is of the coagulated blood, the feverer are the pains, and the longer they continue.

Women in the firft child feldom have after-pains; becaufe, after delivery, the womb is fuppofed to contract, and pufh off the clots with greater force in the firft than in the following labours: after-pains may alfo proceed from obftructions in the veffels, and irritations at the os internum. In order to prevent or remove thefe pains, as foon as the placenta is feparated and delivered, the hand being introduced into the uterus, may clear it of all the coagula. When the womb is felt through the parietes of the abdomen larger than ufual, it may be taken for granted, that there is either another child, or a large quantity of this clotted blood; and, which foever it may be, there is a neceffity for its being extracted. If the placenta comes away of itfelf, and the after-pains are violent, they may be alleviated and carried off by an opiate: for, by fleeping and fweating plentifully, the irritation is removed, the evacuations are increafed, the os uteri is infenfibly relaxed, and the coagula flide eafily along. When the difcharge of the lochia is fmall, the after pains, if moderate, ought not to be reftrained; becaufe the fqueezing which they occafion, promotes the other evacuation, which is neceffary for the recovery of the patient. After pains may alfo proceed from an obftruction in fome of the veffels, occafioning a fmall inflammation of the os internum and ligaments; and the fqueezing thereby occafioned, may not only help to propel the obftructing fluid, but alfo (if not too violent) contribute to the natural difcharges.

Of the LOCHIA.

WE have already obferved, that the delivery of the child and placenta is followed by an efflux of more or lefs blood, difcharged from the uterus, which, by the immediate evacuation of the large veffels, is allowed to contract itfelf the more freely, without the danger of an inflammation, which would probably happen in the contraction, if the great veffels were not emptied at the fame time: but, as the fluids in the fmaller veffels cannot be fo foon evacuated, or returned into the vena cava, it is neceffary, that, after the great difcharge is abated, a flow and gradual evacuation fhould continue, until the womb fhall be contracted to near the fame fize which it had before pregnancy; and to this it attains about the eighteenth or twentieth day after delivery, though the period is different in different women.

When the large veffels are emptied immediately after delivery, the difcharge frequently ceafes for feveral hours, until the fluids in the fmaller veffels are propelled into the larger, and then begins to flow again, of a paler colour.

The red colour of the lochia commonly continues till the fifth day, though it is always turning more and more ferous from the beginning; but, about the fifth day, it flows off a clear, or fometimes (though feldom) of a greenifh tint; for, the mouths of the veffels growing gradually narrower, by the contraction of the uterus, at laft allow the ferous part only to pafs: as for the greenifh hue, it is fuppofed to proceed from a diffolution of the cellular or cribriform membrane or mucus, that furrounded the furface of the placenta and chorion; part of which, being left in the uterus, becomes livid, decays, and, diffolving, mixes with and tinctures the difcharge as it paffes along.

Though the lochia, as we have already obferved, commonly continue to the eighteenth or twentieth day, they are every day diminifhing in quantity, and fooneft ceafe in thofe women who fuckle their children, or have had an extraordinary difcharge at firft; but the colour, quantity, and duration, differ in different women: in fome patients, the red colour difappears on the firft, or fecond day; and in others, though rarely, it continues more or lefs to the end of the month: the evacuation in fome is very fmall, in others exceffive: in one woman it ceafes very foon, in another flows during the whole month: yet, all of thefe patients fhall do well.

Some alledge, that this difcharge from the uterus is the fame with that from a wound of a large furface: but it is more reafonable to fuppofe, that the change of colour and diminution of quantity proceed from the flow contraction of the veffels; becaufe, previous to pus, there muft have been lacerations or impofthumes, and in women who have fuddenly died after delivery no wound or excoriation hath appeared upon the inner furface of the womb, which is fometimes found altogether fmooth, and at other times rough and unequal on that part to which the placenta adhered. The fpace that is occupied before delivery, from being fix inches in diameter, or eighteen inches in circumference, will, foon after the birth, be contracted to one third or fourth of thefe dimenfions.

Of

Of the Milk Fever.

About the fourth day, the breasts generally begin to grow turgid and painful. We have formerly observed, that, during the time of uterine gestation, the breasts in most women gradually increase till the delivery, growing softer as they are enlarged by the vessels being more and more filled with fluids; and by this gradual distention they are prepared for secreting the milk from the blood, after delivery. During the two or three first days after parturition, especially when the woman has undergone a large discharge, the breasts have been sometimes observed to subside and grow flaccid; and about the third or fourth day, when the lochia begin to decrease, the breasts swell again to their former size, and stretch more and more, until the milk, being secreted, is either sucked by the child, or frequently of itself runs out at the nipples.

Most of the complaints incident to women after delivery, proceed either from the obstruction of the lochia in the uterus, or of the milk in the breasts, occasioned by any thing that will produce a fever; such as catching cold, long and severe labour, eating food that is hard of digestion, and drinking fluids that quicken the circulation of the blood in the large vessels; by which means the smaller, with all the secretory and excretory ducts, are obstructed.

The discharge of the lochia being so different in women of different constitutions, and besides in some measure depending upon the method of management, and the way of life peculiar to the patient, we are not to judge of her situation from the colour, quantity, and duration of them, but from the other symptoms that attend the discharge; and if the woman seems hearty, and in a fair way of recovery, nothing ought to be done with a view to augment or diminish the evacuation. If the discharge be greater than she can bear, it will be attended with all the symptoms of inanition; but as the lochia seldom flow so violently as to destroy the patient of a sudden, she may be supported by a proper nourishing diet, assisted with cordial and restorative medicines. Let her, for example, use broths, jellies, and asses milk; if the pulse is languid and sunk, she may take repeated doses of the *confect. cardiac.* with mixtures composed of the cordial waters and volatile spirits: subastringents and opiates frequently administered, with the *cort. Peruvian.* in different forms, and austere wines, are of great service. On the other hand, when the discharge is too small, or hath ceased altogether, the symptoms are more dangerous, and require the contrary method of cure: for now the business is to remove a too great plenitude of the vessels in and about the uterus, occasioning tension, pain, and labour, in the circulating fluids; from whence proceed great heat in the part, restlessness, fever, a full, hard, quick pulse, pains in the head and back, nausea, and difficulty in breathing. These complaints, if not at first prevented, or removed by rest and plentiful sweating, must be treated with venæsection and the antiphlogistic method.

When the obstruction is recent, let the patient lie quiet, and encourage a plentiful diaphoresis, by drinking frequently of warm, weak, diluting fluids, such as water-gruel, barley-water, tea, or weak chicken-broth.

Should these methods be used without success, and the patient, far from being relieved by rest, plentiful sweating, or a sufficient discharge of the obstructed lochia, labour under an hot dry skin, anxiety, and a quick, hard, and full pulse, the warm diaphoretics must be laid aside; because, if they fail of having the desired effect, they must necessarily increase the fever and obstruction, and recourse be had to bleeding at the arm or ancle to more or less quantity, according to the degree of fever and obstruction; and this evacuation must be repeated as there is occasion. When the obstruction is not total, it is supposed more proper to bleed at the ancle than at the arm; and at this last, when the discharge is altogether stopped. Her ordinary drink ought to be impregnated with nitre.

If she is costive, emollient and gently opening glysters may be occasionally injected; and her breasts must be fomented and sucked, either by the mouth or pipe-glasses. If, by these means, the fever is abated, and the necessary discharges return, the patient commonly recovers; but, if the complaints continue, the antiphlogistic method must still be pursued. If, notwithstanding these efforts, the fever is not diminished or removed by a plentiful discharge of the lochia from the uterus, the milk from the breasts, or by a critical evacuation by sweat, urine, or stool, and the woman is every now and then attacked with cold shiverings; an abscess or abscesses will probably be formed in the uterus or neighbouring parts, or in the breasts; and sometimes, the matter will be translated to other situations, and the seat of it foretold from the part's being affected with violent pains: these abscesses are more or less dangerous, according to the place in which they happen, the largeness of the suppuration, and the good or bad constitution of the patient.

If when the pains in the epigastric region are violent, and the fever increased to a very high degree, the patient should all of a sudden enjoy a cessation from pain, without any previous discharge or critical emption, the physician may pronounce that a mortification is begun; especially if, at the same time, the pulse becomes low, quick, wavering, and intermitting: if the woman's countenance, from being florid, turns dusky and pale, while she herself, and all the attendants, conceive her much mended; in that case, she will grow delirious, and die in a very short time.

What we have said on this subject, regards that fever which proceeds from the obstructed lochia, and in which the breasts may likewise be affected: but the milk fever is that in which the breasts are originally concerned, and which may happen though the lochia continue to flow in sufficient quantity; nevertheless, they mutually promote each other, and both are to be treated in the manner already explained; namely, by opiates, diluents, and diaphoretics, in the beginning; and, these prescriptions failing, the obstructions must be resolved by the antiphlogistic method described above. The milk-fever alone, when the uterus is not concerned, is not so dangerous, and much more easily relieved. Women of an healthy constitution, who suckle their own children, have good nipples,

ples, and whose milk comes freely, are seldom or never subject to this disorder, which is more incident to those who do not give suck, and neglect to prevent the secretion in time; or, when the milk is secreted, take no measures for emptying their breasts. This fever likewise happens to women who try too soon to suckle, and continue their efforts too long at one time; by which means, the nipples, and consequently the breasts, are often inflamed, swelled, and obstructed.

In order to prevent too great a turgency in the vessels of the breasts, and the secretion of milk, in those women who do not chuse to suckle, it will be proper to make external application of those things which by their pressure and repercussive force will hinder the blood from flowing in too great quantity to this part, which is now more yielding than at any other time: for this purpose, let the breasts be covered with *emp. de minio*, *diapalma*, or *emp. simp.* spread upon linen, or cloths dipped in camphorated spirits, be frequently applied to these parts and the armpits; while the patient's diet and drink is of the lightest kind, and given in small quantities. Notwithstanding these precautions, a turgency commonly begins about the third day; but by rest, moderate sweating, and the use of these applications, the tension and pain will subside about the fifth or sixth day, especially if the milk runs out at the nipples: but if the woman catches cold, or is of a full habit of body, and not very abstemious, the tension and pain increasing, will bring on a cold shivering succeeded by a fever; which may obstruct the other excretions, as well as those of the breast.

In this case, the sudorifics above recommended must be prescribed; and if a plentiful sweat ensues, the patient will be relieved; at the same time the milk must be extracted from her breasts, by sucking with the mouth or glasses: should these methods fail, and the fever increase, she ought to be blooded in the arm; and instead of the external applications hitherto used, emollient liniments and cataplasms must be substituted, in order to soften and relax. If, in spite of these endeavours, the fever proceeds for some days, the patient is frequently relieved by critical sweats, a large discharge from the uterus, miliary eruptions, or loose stools mixed with milk, which is curdled in the intestines; but, should none of these evacuations happen, and the inflammation continue with increasing violence, there is danger of an imposthume, which is to be brought to maturity, and managed like other inflammatory tumours; and no astringents ought to be applied, lest they should produce schirrhous swellings in the glands.

As the crisis of this fever, as well as of that last described, often consists in miliary eruptions over the whole surface of the body, but particularly on the neck and breast, by which the fever is carried off, nothing ought to be given, which will either greatly increase or diminish the circulating force, but such only as will keep out the eruptions. But if, notwithstanding these eruptions, the fever, instead of abating, is augmented, it will be necessary to diminish its force, and prevent its increase, by those evacuations we have mentioned above. On the contrary, should the pulse sink, the eruptions begin to retreat inwardly, and the morbific matter be in danger of falling upon the viscera, we must endeavour to keep them out, by opiates and sudorific medicines; and here blisters may be applied with success.

Of the Evacuations necessary at the end of the Month after Delivery.

Those who have had a sufficient discharge of the lochia, plenty of milk, and suckle their own children, commonly recover with ease; and as the superfluous fluids of the body are drained off at the nipples, seldom require evacuations at the end of the month: but if there are any complaints from fullness, such as pains and stitches, after the twentieth day, some blood ought to be taken from the arm, and the belly gently opened by frequent glysters, or repeated doses of laxative medicines.

If the patient has tolerably recovered, the milk having been at first sucked or discharged from the nipples, and afterwards discussed, no evacuations are necessary before the third or fourth week; and sometimes not till after the first flowing of the menses, which commonly happens about the fifth week; if they do not appear within that time, gentle evacuations must be prescribed, to carry off the plethora, and bring down the catamenia.

MIGRATION, the passage or removal of a thing out of one place or state into another.

MILAN, the capital of the Milanese, or dutchy of Milan, in Italy: E. long. 9° 30′, N. lat. 45° 25′.

MILBORN-PORT, a borough-town of Somersetshire, twenty-five miles south of Bath. It sends two members to parliament.

MILDEW, a disease happening to plants, caused by a dewy moisture supposed by some to be a species of blight.

MILE, *mille passus*, a measure of length or distance, containing eight furlongs, *&c.*

The English statute-mile is fourscore chains, or 1760 yards; that is, 5280 feet.

We shall here give a table of the miles in use among the principal nations of Europe, in geometrical paces, 60,000 of which make a degree of the equator.

	Geometrical paces.
Mile of Russia	750
of Italy	1000
of England	1250
of Scotland and Ireland	1500
Old league of France	1500
The small league, *ibid.*	2000
The mean league, *ibid.*	2500
The great league of France	3000
Mile of Poland	3000
of Spain	3248

	Geometrical paces.
Mile of Germany	4000
of Denmark	5000
of Hungary	6000

MILFORD HAVEN, the moſt commodious harbour in Great Britain, ſituated in the ſouth weſt part of Pembrokeſhire in Wales, at the north entrance of the Briſtol channel.

MILIARY, in general, ſomething reſembling millet-ſeeds.

Miliary fever. See Medicine, p. 73.

MILITANT, or Church militant, denotes the body of Chriſtians while here on earth.

MILITARY, ſomething belonging to the ſoldiery or militia.

MILITIA, in general, denotes the body of ſoldiers, or thoſe who make profeſſion of arms.

In a more reſtrained ſenſe, militia denotes the trained bands of a town or country, who arm themſelves, upon a ſhort warning, for their own defence. So that, in this ſenſe, militia is oppoſed to regular or ſtated troops.

For the direction and command of the militia, the king conſtitutes lords-lieutenants of each county.

MILIUM, in botany, a genus of the triandria digynia claſs. The corolla conſiſts of two valves including one flower. There are five ſpecies, only one of which, *viz.* the effuſum, or millet-graſs, is a native of Britain.

MILK, a well known animal fluid, which nature prepares in the breaſts of women, and the udders of other animals, for the nouriſhment of their young. Milk is a liquor prepared from the aliment chewed in the mouth, digeſted in the ſtomach, perfected by the force and juices of the inteſtines, and elaborated by means of the meſentery and its gland and juices, and the juices of the thoracic duct. It has undergone ſome actions of the veins, arteries, heart, lungs, and juices, and began to be aſſimilated; yet may ſtill be had ſeparate and diſcharged out of the body. And thus by their own milk, prepared from the proper matter of the chyle, all the known lactiferous animals are nouriſhed, both male and female. For milk is always prepared from chyle as well in men as in women, in virgins and barren women, in mothers and nurſes. Milk approaches nearer to an animal nature than chyle.

If milk be good, and ſuffered to reſt in a clean veſſel, it firſt appears uniformly white; then throws up a white, thick, unctuous cream to its ſurface, and remains ſomewhat bluiſh below. The milks of all the known animals have theſe properties alike. The human milk is very ſweet and thin, the next is that of aſſes, then that of mares, then of goats, and laſtly of cows: whence it is preſcribed in this order to conſumptive perſons of weak viſcera. The rennet prepared of the juices of ſuch creatures as chew the cud being mixed with milk, coagulates it into an uniform maſs, which may be cut with a knife, and it thus ſpontaneouſly ſeparates into whey and curds; if long boiled over the fire, it loſes its more fluid parts, and condenſes into a butyraceous and cheeſy maſs.

Milk is an efficacious remedy in diſorders of the breaſt. But it is to be obſerved, that all milks are not of the ſame kind, and of the ſame efficacy for all purpoſes; ſince, according to the diverſity of animals and their reſpective foods, they are poſſeſſed of different and peculiar qualities which are to be conſidered apart. Firſt, then, aſſes milk, contains a great deal of ſweet ſerum, but a very ſmall quantity of earthy, caſeous, and pinguious ſubſtance; for which reaſon it is not eaſily coagulated, and, conſequently, but very unfit for butter and cheeſe. Its whey is aſtringent, laxative, moiſtening, and proper for correcting the acrimony of the humours. Goats milk does not contain ſo large a quantity of whey as that of aſſes, nor is it of ſo laxative and aſtringent a nature, but of a thicker conſiſtence; and, as goats eat the leaves of trees which contain ſomething of a reſinous quality, their milk is very efficacious for the conſolidation of ſuppurated parts. Cows-milk is more pinguious, contains a large quantity of earth, but leſs whey, for which reaſon it generally yields a great deal of butter and cheeſe. This ſpecies of milk is of a temperating, nutritive and conſolidating virtue. Womens milk, for medicinal purpoſes, is preferable to all others; for it is the ſweeteſt of them all, and its nutritive quality is ſufficiently obſervable in infants. The virtues of milk are alſo different, according to the diverſity of herbs and paſturage which animals eat. Hence milk in the ſpring is highly ſalutary, becauſe at that time the vegetables abound with temperate juices; whereas milk in the winter is accounted leſs ſalutary, becauſe the animals feed on hay and ſtraw.

Dr. Cheyne recommends a milk and ſeed diet, with water for drink, as the ſureſt preſervative againſt diſdiſeaſes, and cure of them.

Milk fever. See Midwifery, p. 244.

MILL, a machine or engine for grinding corn, *&c.* of which there are ſeveral kinds, according to the various methods of applying the moving power; as water-mills, wind-mills, mills worked by horſes, *&c.* See Mechanics.

MILLENARIANS, or Chiliasts, a name given to thoſe, who, in the primitive ages, believed that the ſaints will one day reign on earth with Jeſus Chriſt a thouſand years.

MILLEPES. See Oniscus.

MILLERIA, a genus of the ſyngeneſia polygamia neceſſaria claſs. It has neither receptacle nor pappus; the calix conſiſts of three valves; and the radius of the corolla is dimidiated. There are two ſpecies, both natives of America.

MILLET, in botany. See Milium.

MILLING of cloth. See Fulling.

MILLION, in arithmetick, the number of ten hundred thouſand, or a thouſand times a thouſand. See Arithmetick.

MILLREE, a Portugueſe gold coin, value 5 *s* $7\frac{1}{2}$ *d.*

MILO, or Melo, one of the iſlands of the Archipelago, ſixty miles north of Candia.

MILT, or Melt, is a denomination by which ſome call the rows of fiſhes.

MILTON,

MILTON, the name of several market-towns, as one twelve miles north-east of Dorchester, and another twelve miles north-east of Maidstone.

MILVUS, in ornithology. See FALCO.

MIME, in the ancient comedy, a person who acted any character by mere gestures, and hence denominated pantomime. See PANTOMIME.

MIMESIS, in rhetoric, the imitating the voice and gestures of another person.

MIMOSA, the SENSITIVE PLANT, in botany, a genus of the polygamia monœcia class. The calix of the hermaphrodite consists of five teeth, and the corolla of five segments; it has five or more stamina, one pistillum, and the fruit is a pod; the calix, corolla, and stamina of the male are the same with those of the female. There are 43 species, all natives of the Indies.—The mimosa is called the sensitive plant from its remarkable property of shrinking its leaves and branches upon being touched by the hand or any thing else. This motion it performs by means of three distinct articulations, *viz.* of a single leaf with its pedicle, of the pedicle to its branch, and of the branch to the trunk or main stem: the primary motion of all which is the closing of the two halves of the leaf on its rib; then the rib or pedicle itself closes; and if the motion wherewith the plant is moved be very strong, the very branches have the sensation propagated to them, and apply themselves to the main stem, as the simple leaves did before to their ribs, and these ribs to their branches; so that the whole plant, in this state, forms itself, from a very complexly branched figure, into a sort of straight cylindrical one.

Many attempts have been made to account for the motion of this plant upon mechanical principles; but all these attempts have hitherto proved unsatisfactory.

MIMULUS, in botany, a genus of the didynamia angiospermia class. The calix is prismatical, and consists of four teeth; the corolla is ringent, having the edges of the upper lip bent downwards; and the capsule has two cells, containing many seeds. There are two species, both natives of America.

MIMUSOPS, in botany, a genus of the octandria monogynia class. The calix consists of eight leaves, and the corolla of eight petals; and the drupa is pointed. There are two species, both natives of India.

MINA, in Grecian antiquity, a money of account, equal to an hundred drachms.

MIND, a thinking intelligent being, otherwise called spirit, in opposition to matter or body.

The culture of the human mind is more immediately taught in the sciences of logic and morals. See LOGIC and MORALS.

MINDANAO, the largest of the Philippine islands, except Luconia, is situated between 120° and 126° east longitude, and between 5° and 10° N. lat.

MINDELHEIM, a city of Germany, thirty-three miles south east of Ulm. It is the capital of the principality of Mindelheim, conferred on the duke of Morlborough, by the emperor in 1704.

MINDEN, a city of Germany, the capital of a duchy of the same name, situated forty miles west of Hanover.

MINDORA, one of the Philippine-islands, lies south-west of Luconia, from which it is separated by a narrow channel.

MINE, in natural history, a place under ground, where metals, minerals, or even precious stones are dug up.

As, therefore, the matter dug out of mines is various, the mines themselves acquire various denominations, as gold mines, silver mines, copper mines, iron mines, diamond mines, salt mines, mines of antimony, of alum, &c.

Mines, then, in general, are veins or cavities within the earth, whose sides receding from, or approaching nearer to each other, make them of unequal breadths in different places, sometimes forming larger spaces which are called holes: they are filled with substances, which, whether metallic or of any other nature, are called the loads; when the substances forming these loads, are reducible to metal, the loads are by the miners said to be alive, otherwise they are called dead loads. In Cornwal and Devon, the loads always hold their course from eastward to westward; though in other parts of England, they frequently run from north to south. The miners report, that the sides of the load never bear in a perpendicular, but constantly under-lay either to the north or to the south. The load is frequently intercepted by the crossing of a vein of earth, or stone, or some different metallic substance; in which case it generally happens that one part of the load is moved a considerable distance to the one side. This transient load is by the miners called flooking; and the part of the lead which is to be moved, is said to be heaved.

According to Dr Nicols's observations upon mines, they seem to be, or to have been, the channels thro' which the waters pass within the earth, and, like rivers, have their small branches opening into them, in all directions. Most mines have streams of water running through them; and when they are found dry, it seems to be owing to the waters having changed their course, as being obliged to it, either because the load has stopped up the ancient passages, or that some new and more easy ones are made.

Mines, says Dr Shaw, are liable to many contingencies; being sometimes poor, sometimes soon exhaustible, sometimes subject to be drowned, especially when deep, and sometimes hard to trace; yet there are many instances of mines proving highly advantageous for hundreds of years: the mines of Potosi are to this day worked with nearly the same success as at first; the gold mines of Cremnitz have been worked almost these thousand years; and our Cornish tin mines are extremely ancient. The neat profit of the silver alone, dug in the Misnian silver mines in Saxony, is still, in the space of eight years, computed at a thousand six hundred and forty-four millions, besides seventyt-hree tons of gold. Many mines have been discovered by accident: a torrent first laid open a rich vein of the silver mine at Friburg in Germany; sometimes a violent

violent wind, by blowing up trees, or overturning the parts of rocks, has discovered a mine; the same has happened by violent showers, earthquakes, thunder, the firing of woods, or even the stroke of a ploughshare or horse's hoof.

But the art of mining does not wait for these favourable accidents, but directly goes upon the search and discovery of such mineral veins, ores, or sands, as may be worth the working for metal. The principal investigation and discovery of mines depend upon a particular sagacity, or acquired habit of judging from particular signs, that metallic matters are contained in certain parts of the earth, not far below its surface. The principal signs of a latent metallic vein, seem reducible to general heads; such as, 1. The discovery of certain mineral waters. 2. The discolouration of the trees or grass of a place. 3. The finding of pieces of ore on the surface of the ground. 4. The rise of warm exhalations. 5. The finding of metallic sands, and the like. All which are so many encouragements for making a stricter search near the places where any thing of this kind appears; whence rules of practice might be formed for reducing this art to a greater certainty. But when no evident marks of a mine appears, the skilful mineralist usually bores into the earth, in such places as from some analogy of knowledge, gained by experience, or by observing the situation, course, or nature of other mines, he judges may contain metal.

After the mine is found, the next thing to be considered, is whether it may be dug to advantage. In order to determine this, we are duly to weigh the nature of the place, and its situation, as to wood, water, carriage, healthiness, and the like; and compare the result with the richness of the ore, the charge of digging, stamping, washing, and smelting.

Particularly the form and situation of the spot should be well considered. A mine must either happen, 1. In a mountain. 2. In a hill. 3. In a valley. Or, 4. In a flat. But mountains and hills are dug with much greater ease and convenience, chiefly because the drains and burrows, that is, the adits or avenues, may be here readily cut, both to drain the water and to form gang-ways for bringing out the lead, *&c.* In all the four cases we are to look out for the veins which the rains, or other accidental thing, may have laid bare; and if such a vein be found, it may often be proper to open the mine at that place, especially if the vein prove tolerably large and rich: otherwise the most commodious place for situation is to be chose for the purpose, *viz.* neither on a flat, nor on the tops of mountains, but on the sides. The best situation for a mine, is a mountainous, woody, wholesome spot; of a safe easy ascent, and bordering on a navigable river. The places abounding with mines are generally healthy, as standing high, and every where exposed to the air; yet some places, where mines are found, prove poisonous, and can, upon no account, be dug, though ever so rich: the way of examining a suspected place of this kind, is to make experiments upon brutes, by exposing them to the effluvia or exhalations, to find the effects.

Devonshire and Cornwal, where there are a great many mines of copper and tin, is a very mountainous country, which gives an opportunity in many places to make adits, or subterraneous drains, to some valley at a distance, by which to carry off the water from the mine, which otherwise would drown them out from getting the ore. These adits are sometimes carried a mile or two, and dug at a vast expence, as from 2000 l. to 4000 l. especially where the ground is rocky; and yet they find this cheaper than to draw up the water out of the mine quite to the top, when the water runs in plenty, and the mine is deep. Sometimes, indeed, they cannot find a level near enough, to which an adit may be carried from the very bottom of the mine; yet they find it worth while to make an adit at half the height to which the water is to be raised, thereby saving half the expence.

The late Mr Costar, considering that sometimes from small streams, and sometimes from little springs, or collections of rain-water, one might have a pretty deal of water above ground, though not a sufficient quantity to turn an overshot-wheel, thought, that if a sufficient fall might be had, this collection of water might be made useful in raising the water in a mine to the adit, where it may be carried off.

MINE, in the military art, denotes a subterraneous canal, or passage, dug under the wall or rampart of a fortification, intended to be blown up by gun-powder.

The alley or passage of a mine is commonly about four feet square; at the end of this is the chamber of the mine, which is a cavity about five feet in width and in length, and about six feet in height; and here the gun-powder is stowed. The fauciffe of the mine, is the train, for which there is always a little aperture left. There are various kinds of mines, which acquire various names, as royal mines, serpentine-mines, forked mines, according as their passages are straight, oblique, winding, *&c.*

MINEHEAD, a borough and port town of Somersetshire, which sends two members to parliament: W. long. 3° 20′, N. lat. 51° 18′.

MINERAL, in natural history, is used, in general, for all fossil bodies, whether simple or compound, dug out of a subterraneous mine, from which it takes its denomination.

MINERAL *Waters*, in medicine, all those wherein any medicinal virtues, besides those of common water, are found.

These mineral waters are of various kinds, but they are considered under the general titles of chalybeate, purgative, and alterative. The more useful and commodious additions for examining these three kinds of mineral waters, are, according to Dr Shaw, galls, syrup of violets, and oil of tartar per deliquium. Galls discover in them any small proportion of vitriol or dissolved iron, as having the property of immediately striking a purple or black colour in all waters where any such substance is lodged. Spirit of violet, in the same

ſame manner, diſcovers any ſmall predominancy of an acid or alkali therein, by changing the water red if acid, and green if alkali preſides. Oil of tartar diſcovers any ſmall proportion of earthy matter leſs capable of diſſolving in water than that ſalt, by precipitating ſuch earthy matter in form of a white cloud to the bottom of the containing glaſs, where it collects and appears like a ſubtile white powder.

Theſe particulars may be ſhewn, and proved ſatisfactorily, by adding to pure water a little of a known acid, alkali, diſſolved iron, and ſubtile earth, or fine light ſediment of an earthy water; applying the ſyrup of violets, galls, and oil of tartar reſpectively.

Mineral waters are imitable by art. The rule is, by a proper analyſis to find the contents of ſuch water (by evaporation, the addition of tinging ingredients, *&c.* as above mentioned) and their proportions; then, by means of ſynthetical chemiſtry, to compoſe a ſimilar mixture: thus, for example, we learn by a proper analyſis, that the ingredients, or different conſtituent parts of Pyrmont waters, are a ſubtile aqueous fluid, a volatile iron, and a predominating alkali, all joined together in one briſk pungent ſpirituous water. The imitation of this kind of chalybeate water, is by much the moſt difficult, and may perhaps be rendered moſt perfect, by boiling the pureſt common water in a cloſe veſſel, with a ſmall proportion of ochre, ſoft iron ore, or pyrites.

The imitation of the common purgative mineral waters is eaſy: thus Epſom water is imitated by barely diſſolving three or four drams of Epſom ſalt in a quart of pure water, made ſomewhat briſk or quick with a few drops of ſpirit of vitriol and oil of tartar per deliquium, ſo as to let the alkali prevail.

The imitation of the alterative waters, ſuch as thoſe of Bath, Buxton, *&c.* has hitherto ſcarce been attempted, nor can be rationally, for want of their reſpective juſt analyſis, upon which ſuch imitation ſhould always be grounded.

As to the uſe of mineral waters, the learned Heiſter obſerves, that in general they are found to agree much better with perſons in the middle ſtages of life, than with perſons very old or very young. If any general rule can be given in this caſe, it is, that people ſhould not take them when younger than eighteen, or older than ſixty.

MINERVALIA, in Roman antiquity, feſtivals celebrated in honour of Minerva, in the month of March; at which time the ſcholars had a vacation, and uſually made a preſent to their maſters, called, from this feſtival, *minerval.*

MINHO, a great river of Spain, which taking its riſe in Gallicia, divides that province from Portugal, and falls into the Atlantic at Caminha.

MINIATURE, a delicate kind of painting, diſtinguiſhed from all others by the ſmallneſs of the figures, its being performed with dots or points inſtead of lines; by the faintneſs of the colouring; its requiring to be viewed very near: and by its being uſually done on vellum.

This is the niceſt and moſt tedious of all kinds of painting, being performed wholly with the point of the pencil: for when the colours are laid on flat without dotting, though the figures be ſmall, and the ground either vellum or paper, it is not called painting in miniature, but waſhing. There are ſome painters who never uſe any white colour in painting in miniature, but make the ground of the vellum ſerve to raiſe their figures; in which caſe the lights appear bright in proportion to the depth and ſtrength of the colours of the figures. Others, before they go to work, give the vellum a light waſh with white lead well prepared and purified. Theſe colours that have the leaſt body, are the beſt and moſt commodious for painting in miniature; as carmine, ultramarine, fine lakes, and greens made of herbs and flowers: but beſides theſe, the following colours are alſo made uſe of, *viz.* vermilion, black lead, brown red, maſticote pale, yellow maſticote, indigo, ivory black, lamp black, Spaniſh brown, umber, gall ſtone, brown ochre, French pink, orpiment, gamboge, Naples yellow, bladder-green, verditer, ſea-green, German aſhes, flake white, and white lead. All terrene colours, and other groſs ſubſtances, are too coarſe for fine work, how well-ſoever they may be ground: but the fineſt particles may be ſeparated by tempering the colour in a cup of fair water; and having ſtirred it well with your finger, and the whole being thoroughly mixed, let it ſubſide for a while, and then pour it by inclination into a ſhell that has been well ſcoured in hot water, and let it ſtand to dry. Yellow ochre, brown red, umber, and ultramarine, purify by fire; but if they are burnt in too fierce a fire, they change, and the brown red turns yellow, the yellow ochre and umber turn reddiſh, and ſo of the reſt: if the fire is not too fierce, it renders them ſofter and kinder than before, ſo that the fineſt and pureſt ultramarine, burnt in a red hot ſhovel, becomes much more brilliant than it was before it was burnt. Greens, blacks, greys, and yellows, on being mixed with a little of the gall of the ox, carp, or eel, eſpecially of the laſt, acquire a luſtre and vivacity not natural to them. You muſt take the galls of eels, and hang them on a nail to dry; and when you uſe any ſteep it in brandy, and mingle ſome of it with the colour already tempered with gum water wherein is a little ſugar-candy. When you begin to paint, the colours muſt be placed on a ſmall ivory pallet of the ſize of your hand, in the middle of which ſhould be placed the white, well ſpread out, and nearer it the lighter, and further off thoſe darker colours you are going to uſe.

Your vellum muſt be glued to a copper-plate, or a piece of thin board, exactly of the ſame ſize with the intended piece; in doing which, the fair ſide of the vellum ſhould be moiſtened with a fine wet linen, and a piece of white paper being put upon the back of it, it is to be applied to the plate or board, and ſtretching it upon it equally in all directions, the vellum, which ought to be every way a finger's-breadth larger than what you glue it to, in order to be doubled over and glued behind. When your piece is ſketched out upon the vellum with a pencil, you muſt, with a little thin carmine, run over all the ſtrokes that they may not be defaced in working; and this done, clean your vellum with crumb of bread. In laying on the colours, begin with ſketching or drawing with large,

bold, but clear ſtrokes; like thoſe who paint in oil; your lights muſt at firſt be ſomething brighter, and your ſhades not quite ſo dark as is required in finiſhing; becauſe in ſtrippling upon them you ſtrengthen the colour, which, if too deep at firſt, would in finiſhing become too dark. Endeavour alſo to drown your colours into each other, that no line of ſeparation may be ſeen between them: to this purpoſe, ſoften your ſtrokes with the colours on each ſide of them, ſo that they may be blended and confounded with each other. There are ſeveral ways of ſtrippling, and every painter has his manner: ſome do it with round points, others make them longiſh; others again hath fine ſtrokes, croſſing each other in all directions, till the whole appears as if ſtrippled or wrought with points: this laſt method is the beſt, boldeſt, and ſooneſt perfected: the artiſt ſhould here accuſtom himſelf to be rich, mellow, and ſoft in his work; the points muſt ſeem in a manner loſt in the ground they are wrought upon, and appear but juſt enough to ſhew that the piece is ſtrippled. When the work ſeems finiſhed, heightening it a little has a fine effect; that is, ſtrengthening the lights with touches of a paler colour than at firſt, which muſt be ſoftened away into the reſt.

For laces, point, and the like, lay on firſt a mixture of blue, black, and white, as for linens; and then heighten the pattern, flowers or flouriſhes, with white only; then ſhade and finiſh with the firſt colour. When they are upon fleſh, or any thing elſe which you would have ſeen through them, finiſh what is under them, as if you intended to lay nothing upon it, and then lay on the lace or point with pure white, and finiſh with the other mixture. In painting a fur, lay on a ground as for drapery, according to the colours of it, and then ſhade by the ſame rule; and having done, inſtead of ſtrippling, draw fine ſtrokes this way and that, according as the down of the fur you imitate lies: heighten the lights of a brown fur with ochre and white, and thoſe of a light fur with white and a little blue.

There are ſeveral ſorts of grounds for pictures and portraits: ſome are quite brown, with Spaniſh brown, umber, *&c.* with a little black and white; others are more yellow, being mixed with a good deal of ochre; others are upon the grey, with indigo; and others are blue or crimſon.

To make a ground all of glory, firſt lay a bright mixture of a little ochre and white, adding more and more of the firſt, as you draw more and more towards the extremities of the intended picture; and when the ochre happens not to be dark enough (for you muſt go on darkening and darkening,) add gall-ſtone, then carmine, and at laſt Spaniſh brown. This ground you muſt lay in ſuch a manner, that the different degrees of darkneſs may, as much as poſſible, inſenſibly increaſe and ſtrengthen: the whole muſt then be ſtrippled with the ſame colours.

For a day-ſky, mingle ſome ultramarine with a good deal of white, and lay it on as ſmooth and uniform as poſſible with a large pencil and broad ſtrokes, laying it on paler and paler as you deſcend towards the horizon, which muſt be made of vermilion, mine-de-plumb and white, of the ſtrength that finiſhes the ſky, or rather a little weaker, artfully blending the blue and red, mingling at laſt gall-ſtone and a good deal of white; and all this muſt be ſo laid on that no ſeparation muſt be ſeen between the colours. When there are to be clouds in the ſky, you need lay on no blue where they are to be; but ſketch them out, if they are reddiſh, with vermilion, gall-ſtone, and white, together with a little indigo; and if they are to be darker, a great deal muſt be uſed of this laſt, making the lights of the one and the other with maſticot, vermilion, and white, according to the degree of ſtrength you would give them, ſwelling out the whole with ſtrippling; and if the ſky be not ſufficiently uniform, you muſt ſtripple that likewiſe.

MINIM, in muſic, a note equal to two crotchets, or half a ſemibreve. See Music.

MINIMUM, in the higher geometry, the leaſt quantity attainable in a given caſe.

MINISTER, a perſon who preaches, performs religious worſhip in public, adminiſters the ſacraments, *&c.*

Ministers, in Scots law. See Law, Tit. 5.

Minister *of ſtate*, a perſon to whom a ſovereign prince intruſts the adminiſtration of the government.

Foreign Minister, is a perſon ſent into a foreign country, to manage the affairs of his province, or of the ſtate to which he belongs. Of theſe there are two kinds; thoſe of the firſt rank are embaſſadors and envoys extraordinary, who repreſent the perſons of their ſovereigns. The miniſters of the ſecond rank are the ordinary reſidents. See Embassador.

MINIUM, or red-lead. See Chemistry, p. 84. and 136.

MINOR, in Scots law. See Law, Tit. 7.

Minor, in logic, the ſecond propoſition of a regular ſyllogiſm. See Logic.

MINORCA, an iſland in the Mediterranean, about twenty miles eaſt of Majorca, thirty miles long, and twelve broad. It is ſubject to Great Britain, and only valued for its capacious harbour of Port Mahon.

MINOTAUR, in antiquity, a fabulous monſter much talked of by the poets, feigned to be half man and half bull.

The minotaur was brought forth by Paſiphae, wife of Minos, king of Crete. It was ſhut up in the labyrinth of that iſland, and at laſt killed by Theſeus.

Servius gives the explanation of this fable: he ſays that a ſecretary of king Minos, named Taurus, *bull*, having an intrigue with the queen Paſiphae, in the chamber of Dædalus, ſhe was at length delivered of twins; one of whom reſembled Minos, and the other Taurus. This occaſioned the production to be reputed monſtrous.

MINSTREL, an ancient term for a fidler, or player on any other kind of muſical inſtrument.

MINT, the place in which the king's money is coined. See Coinage.

There were anciently mints in almoſt every county in England; but the only mint at preſent in the Britiſh dominions, is that in the Tower of London. The officers of the mint are, 1. The warden of the mint, who is chief; he overſees the other officers, and receives the bullion. 2. The maſter worker; who receives the bullion

bullion from the warden, causes it to be melted, delivers it to the moneyers, and when it is coined receives it again. 3. The comptroller, who is the overseer of all the inferior officers, and sees that all the money is made to the just assize. 4. The assay-master; who weighs the gold and silver, and sees that it is according to the standard. 5. The auditor; who takes the accounts. 6. The surveyor of the melting; who after the assay-master has made trial of the bullion, sees that it is cast out, and not altered after it is delivered to the melter. 7. The engraver; who engraves the stamps and dyes for the coinage of the money. 8. The clerk of the irons; who sees that the irons are clean and fit to work with. 9. The melter; who melts the bullion before it is coined. 10. The provost of the mint; who provides for, and oversees all the moneyers, 11. The blanchers; who anneal and cleanse the money. 12. The moneyers; some of whom forge the money, some shear it, same round and mill it, and some stamp or coin it. 13. The porters; who keep the gate of the mint.

MINT, in botany, See MENTHA.

MINUARTIA, in botany, a genus of the triandria trigynia class. The calix consists of five leaves; it has no corolla; and the capsule has one cell and three valves. There are three species, all natives of Spain.

MINUET, in music, a very graceful kind of dance, which consists of a coupee, a high step, and a balance; it begins with a beat, and its motion is triple.

MINUTE, in geometry, the sixtieth part of a degree of a circle. See ASTRONOMY, GEOGRAPHY, GEOMETRY.

MINUTE *of time*, the sixtieth part of an hour.

MINUTE, in architecture, usually denotes the sixtieth, sometimes the thirtieth part of a module. See ARCHITECTURE.

MINUTE is also used for a short memoir, or sketch of a thing, taken in writing.

MIRABILIS, MARVEL OF PERU, in botany, a genus of the pentandria monogynia class. The corolla is funnel-shaped; the calix is below the fruit; and the nectarium is globular, including the germen. There are three species, all natives of America.

Tournefort and Linnæus will have the root of this plant to be the jalap of the shops; but Houston declares, that jalap is the root of a species of convolvulus.

MIRACLE, is a work effected in a manner different from the common and regular method of providence, by the interposition either of God himself, or some intelligent agent superior to man.

MIRALETUS, in ichthyology. See RAJA.

MISCHNAH, or MISNAH, the code or collection of the civil law of the Jews. The Jews pretend, that when God gave the written law to Moses, he gave him also another not written, which was preserved by tradition among the doctors of the synagogue, 'till rabbi Judah, surnamed the Holy, seeing the danger they were in, through their dispersion, of departing from the traditions of their fathers, judged it proper to reduce them to writing.

The misnah is divided in six parts: the first relates to the distinction of seeds in a field, to trees, fruits, tythes, *&c.* The second regulates the manner of observing festivals: the third treats of women, and matrimonial cases: the fourth of losses in trade, *&c.*: the fifth is on obligations, sacrifices, *&c.*: and the sixth treats of the several sorts of purification.

MISDEMEANOUR, in law, signifies a heinous offence or fault, particularly in the execution of an office.

MISFEASANCE, in law-books, signifies a trespass.

MISLETOE, in botany. See VISCUM.

MISNOMER, in law, a misnaming, or mistaking a person's name. The Christian name of a person should always be perfect, but the law is not so strict and precise in regard to surnames, a small mistake in which will be dispensed with to make good a contract, and support the act of the party.

MISPRISION signifies, in general, some neglect or oversight; as where a person is privy to a treason or felony committed by another, and neglects to reveal it to the king or his council, or to a magistrate; but entirely conceals it: this is called misprision of those crimes. In cases of misprision of treason, the offender is to be imprisoned for life, and to forfeit his goods and chattels, together with the profits of his lands, *&c.* but in misprision of felony, the offender is only to be punished with fine and imprisonment, and to remain in prison till the fine is paid.

MISSAL, the Romish mass-book, containing the several masses to be said on particular days.

MISSEL BIRD. See TURDUS.

MISSIONARIES, such ecclesiastics as are sent by any Christian church, into pagan or infidel countries, to convert the natives, and establish the Christian religion among them.

MISUSER, in law, signifies some abuse of any particular liberty or benefit.

MISY, in natural history, a species of the chalcantha, a fossil very common in the Turkish dominions, and sometimes found in the mines at Cremnitz in Hungary.

It is a considerably firm substance, of an irregular texture, not compact, much resembling some of our more gaudy marchasites, but wanting in their hardness and weight. It is of no determinate shape or size, but it is oftentimes found in small detached masses, which are usually broad, flat, and very rugged at the edges. As to its medical virtues, they are no other than those of the green vitriol.

MITCHELLA, in botany, a genus of the tetrandria monogynia class. The corolla consists of one petal; it has four stigmata; and the berry is bifid, containing four seeds. There is but one species, a native of Carolina.

MITE, a small coin formerly current, equal to about one third part of a farthing.

MITE, in zoology. See ACARUS.

MITELLA, in botany, a genus of the decandria digynia class. The calix consists of five segments, the corolla of five pinnatifid petals inserted into the calix, and the capsule of two equal valves. There are two species, none of them natives of Britain.

MITRALES VALVULÆ. See ANATOMY, p. 279.

MITRE, a sacerdotal ornament worn on the head by bishops and certain abbots on solemn occasions; being a sort

ſort of cap, pointed, and cleft at top. The high prieſt among the Jews wore a mitre or bonnet on his head. The inferior prieſts among the Jews had likewiſe their mitres, but in what reſpect they differed from that of the high-prieſt is uncertain. Some contend that the ancient biſhops wore mitres, but this is by no means certain.

MITREOLA, in botany. See Ophiorrhiza.

MITTAU, the capital of the duchy of Courland, in Poland: ſituated in E. long. 24°, N. lat. 56° 40′.

MITTIMUS, as generally uſed, hath two ſignifications. 1. It ſignifies a writ for removing and transferring of records from one court to another. 2. It ſignifies a precept, or command in writing under the hand and ſeal of a juſtice of the peace, directed to the gaoler or keeper of ſome priſon, for the receiving and ſafe keeping of an offender charged with any crime until he be delivered by due courſe of law.

MIXT, or mixt body, in chemiſtry, that which is compounded of different elements or principles. See Chemistry.

MIXTURE, a compound, or aſſemblage of ſeveral different bodies in the ſame maſs. See Chemistry.

MIZEN, in the ſea-language, is a particular maſt or ſail. The mizen-maſt ſtands in the ſternmoſt part of the ſhip. In ſome great ſhips there are two of theſe; when that next the main-maſt is called the main-mizen, and that next the poop the bonaventure-mizen.

MNIUM, in botany, a genus of the cryptogamia muſci claſs. The anthera is operculated; and the capitulum of the female is naked, and duſty. There are 18 ſpecies, 7 of which are natives of Britain.

Perpetual Mobile, or Movement. See Movement.

MOCO, or Mocho, a great city and port-town of Arabia Felix, ſituated near the ſtraits of Babelmandel, at the entrance of the Red-Sea: E. long 45°, N lat. 13°.

MODBURY, a market-town of Devonſhire, 32 miles ſouth-weſt of Exeter.

MODE, in metaphyſics, denotes the manner of a thing's exiſtence. See Metaphysics, p. 179.

Mode, in muſic, is defined to be a particular manner of conſtituting the octave; or, it is the melodious conſtitution of the octave, as it conſiſts of ſeven eſſential ſounds, beſides the key or fundamental.

A mode, then, is the particular order of the concinnous degrees of an octave; the fundamental note whereof may be called the key, as it ſignifies that principal note which regulates the reſt.

MODEL, in a general ſenſe, an original pattern, propoſed for any one to copy or imitate.

This word is particularly uſed, in building, for an artificial pattern made in wood, ſtone, plaſter, or other matter, with all its parts and proportions, in order for the better conducting and executing ſome great work, and to give an idea of the effect it will have in large. In all great buildings, it is much the ſureſt way to make a model in relievo, and not to truſt to a bare deſign or draught.

MODENA, a duchy of Italy, bounded by Mantua on the north, by Romania on the eaſt, by Tuſcany and Lucca on the ſouth, and by Parma and the territory of Genoa on the weſt.

Modena, the capital of the duchy of that name, ſituated in 11° 20′ E. long. and 44° 45′ N. lat.

MODERATOR, in the ſchools, the perſon who preſides at a diſpute, or in a public aſſembly: thus the preſident of the annual aſſembly of the church of Scotland, is ſtyled moderator.

MODERN, in a general ſenſe, ſomething new, or of our time, in oppoſition to what is antique or ancient.

MODICA, a town of Sicily, in the province of Noto, twenty-five miles ſouth of Syracuſe.

MODIFICATION, in philoſophy, that which modifies a thing, or gives it this or that manner of being.

Quantity and quality are accidents which modify all bodies.

Decree of Modification, in Scots law, a decree aſcertaining the extent of a miniſter's ſtipend, without proportioning it among the perſons liable in payment. See Law, Tit. v. 13.

MODILLIONS, in architecture, ornaments in the corniche of the Ionic, Corinthian, and Compoſite columns. See Architecture.

MODIUS, in antiquity, a kind of dry meaſure, in uſe among the Romans, for ſeveral ſorts of grain.

MODULATION, in muſic, the art of keeping in, or changing the mode or key.

MODULE, in architecture, a certain meaſure or bigneſs, taken at pleaſure, for regulating the proportions of columns, and the ſymmetry or diſpoſition of the whole building. Architects generally chuſe the ſemidiameter of the bottom of the column for their module, and this they ſubdivide into parts or minutes. See Architecture.

MOHERINGIA, in botany, a genus of the octandria digynia claſs. The calix has 4 leaves, and the corolla 4 petals, and the capſule conſiſts of one cell and 4 valves. There is but one ſpecies, a native of Switzerland.

MOFFAT, a village in the ſhire of Annandale, thirty-ſix miles ſouth weſt of Edinburgh; famous for its mineral wells, one of which is uſed for bathing, and the water of the other is taken inwardly. Theſe waters are of great ſervice in grippings of the guts, colics, and pains in the ſtomach. Thoſe who are troubled with obſtructions, rheumatic pains, and aches, find great relief both from bathing and drinking; nor is this water a leſs ſovereign remedy in ſcorbutic caſes, and the king's evil. Theſe wells, in the opinion of Dr Plummer, profeſſor of medicine in the univerſity of Edinburgh, owe their virtues to a ſulphureous principle.

MOGULS, or Monguls, hoards or tribes of vagrant Tartars, on the north of India, from whom the moguls or ſovereigns of India, as well as of the Uſbec-Tartars, are deſcended.

MOHAIR, in commerce, the hair of a kind of goat, frequent about Angoura, in Turky; the inhabitants of which city are all employed in the manufacture of camblets, made of this hair.

MOHAWK-country, a part of North America, inhabited by one of the five nations of the Iroquois, ſituated between the province of New York and the lake Ontario or Frontignac.

MOHILA,

MOHILA, one of the Comora-iſlands in the Indian ocean, ſituated between Madagaſcar and the continent of Africa: E. long. 43° 30′, S. lat. 12°.

MOIDORE, a Portugueſe gold coin, value 1l. 7s. Serling.

MOIETY, the half of any thing.

MOLA, in geography, a town of Italy, ſeven miles eaſt of the city of Barri, in the kingdom of Naples.

Mola, in ichthyology. See Tetrodon.

MOLARES, or dentes molares, in anatomy, the large teeth called in Engliſh grinders. See Anatomy, p. 165.

MOLDAVIA, a province of European Turky, ſeparated from Poland by the river Neiſter.

MOLE, in zoology. See Talpa.

Mole Cricket. See Gryllus.

Mole, in midwifery, a maſs of fleſhy matter, of a ſpherical figure, generated in the uterus, or womb, and ſometimes miſtaken for a child. See Midwifery.

Mole, in geography, a river in Surry, ſo called from its running, for part of its courſe, under ground.

Mole, is alſo a maſſive work of large ſtones laid in the ſea by means of cofferdams; extending before a port, either to defend the harbour from the impetuoſity of the waves, or to prevent the paſſage of ſhips without leave.

Action of MOLESTATION, in Scots law. See Law, Tit. xxx. 19.

MOLLUGO, in botany, a genus of the triandria trigynia claſs. The calix conſiſts of five leaves; the corolla is wanting; and the capſule has three cells and three valves. There are five ſpecies, none of them natives of Britain.

MOLLOSSES, in commerce, the thick fluid matter remaining after the ſugar is made, reſembling ſyrup.

In Holland moloſſes are much uſed in the manufacture of tobacco, and by the poor people for ſugar. A brandy is alſo diſtilled from them, but it is ſaid to be unwholeſome.

MOLOSSUS, in Greek and Latin poetry, a foot compoſed of three long ſyllables, as *delectant*.

MOLUCCA-islands, five iſlands in the Indian ocean, the largeſt of which is ſcarce thirty miles round; they are called Bachian, Machian, Motyr, Ternate, and Tydor; they produce ſago, oranges, lemons, and ſome other fruits; but what is peculiar to theſe iſlands, is their producing cloves. They are ſubject to the Dutch, and are ſituated in 125° of eaſt longitude, and between 50′ ſouth, and 2° north latitude.

MOLUCCELLA, in botany, a genus of the didynamia gymnoſpermia claſs. The calix is bell-ſhaped, and larger than the corolla. There are three ſpecies, none of them natives of Britain.

MOLWITZ, a town of Sileſia in the kingdom of Bohemia: E long. 16° 45′, N. lat. 50° 26′.

MOLYBDIA, in natural hiſtory, the name of a genus of cryſtals, of a cubic form, or compoſed of ſix ſides, at right angles, like a dye.

MOMBAZA, or Monbasa, an iſland and city on the eaſt coaſt of Africa, oppoſite to the country of Mombaza, in Zanguebar: E. long. 48°, N. lat. 4°.

MOMENT, in the doctrine of time, an inſtant, or the moſt minute and indiviſible part of duration.

MOMENTUM, in mechanics, ſignifies the ſame with impetus, or the quantity of motion in a moving body; which is always equal to the quantity of matter multiplied into the velocity; or, which is the ſame thing, it may be conſidered as a rectangle under the quantity of matter and velocity.

MOMORDICA, in botany, a genus of the monœcia ſyngeneſia claſs. The calix of the male and female conſiſts of five ſegments; the corolla of the male has ſix ſegments; and the filaments are three. The corolla of the female conſiſts of five ſegments; and it has three ſtyli. There are eight ſpecies, none of them natives of Britain.

MONA, an iſland in the Baltic, ſouth-weſt of the iſland of Zealand, ſubject to Denmark: E. long. 12° 30′, N. lat. 55° 20′.

MONADELPHIA, in botany. See Botany, p. 635.

MONAGHAN, a county of Ireland, in the province of Ulſter, bounded by Tyrone, on the north; by Armagh, on the eaſt; by Caven and Louth, on the ſouth; and by the county of Farmanagh, on the weſt.

MONANDRIA, in botany. See Botany, p. 635.

MONARCHY, a government in which the ſupreme power is veſted in a ſingle perſon. See Government.

MONARDA, in botany, a genus of the diandria monogynia claſs. The corolla is unequal, the ſuperior lip involving a linear filament. It has four ſeeds. There are five ſpecies, none of them natives of Britain.

MONASTERY, a convent, or houſe built for the reception and entertainment of monks, mendicant friars, or nuns, whether it be an abbey, priory, *&c.*

Monaſteries are governed by different rules, according to the different regulations preſcribed by their founders. The firſt regular and perfect monaſteries were founded by St. Pachomius, in Egypt: but St. Baſil is generally conſidered as the great father and patriarch of the Eaſtern monks; ſince in the fourth century he preſcribed rules for the government of the monaſteries, to which the Anachorets and Coenobites, and the other ancient fathers of the deſerts, ſubmitted. In like manner St. Benedict was ſtyled the patriarch of the Weſtern monks. He appeared in Italy towards the latter end of the fifth century, and publiſhed his rule, which was univerſally received throughout the weſt. St. Auguſtin being ſent into England by St Gregory the pope, in the year 596, to convert the Engliſh, he at the ſame time introduced the monaſtic ſtate into this kingdom; which made ſuch progreſs here, that within the ſpace of two hundred years, there were thirty kings and queens who preferred the religious habit to their crowns, and founded ſtately monaſteries, where they ended their days in ſolitude and retirement.

MONASTIC, ſomething belonging to monks. See Monk.

MONCON, a two of Spain, in the province of Arragon, fifty miles north-eaſt of Saragoſſa.

MONDAY, the ſecond day of the week, ſo called as being anciently ſacred to the moon, *q. d.* moon-day.

MONEMUGI a country in the ſouth of Africa, ſituated between Angola and Zanguebar.

MONEY, a piece of matter, commonly metal, to which public authority has affixed a certain value and weight to ſerve as a medium in commerce.

Of artificial or material money.

I. From the infancy of the world, at leaſt as far back as our accounts of the tranſactions of mankind reach, we find they had adopted the precious metals, that is, ſilver and gold, as the common meaſure of value, and as the adequate equivalent for every thing alienable.

The metals are admirably adapted for this purpoſe: They are perfectly homogeneous: When pure, their maſſes, or bulks, are exactly in proportion to their weights: No phyſical difference can be found between two pounds of gold, or ſilver, let them be the production of the mines of Europe, Aſia, Africa, or America: They are perfectly malleable, fuſible, and ſuffer the moſt exact diviſion which human art is capable to give them: They are capable of being mixed with one another, as well as with metals of a baſer, that is, of a leſs homogeneous nature, ſuch as copper: By this mixture they ſpread themſelves uniformly through the whole maſs of the compoſed lump, ſo that every atom of it becomes proportionally poſſeſſed of a ſhare of this noble mixture; by which means the ſubdiviſion of the precious metals is rendered very extenſive.

Their phyſical qualities are invariable; they loſe nothing by keeping; they are ſolid and durable; and though their parts are ſeparated by friction, like every other thing, yet ſtill they are of the number of thoſe which ſuffer leaſt by it.

If money, therefore, can be made of any thing, that is, if the proportional value of things vendible can be meaſured by any thing material, it may be meaſured by the metals.

II. The two metals being pitched upon as the moſt proper ſubſtances for realizing the ideal ſcale of money, thoſe who undertake the operation of adjuſting a ſtandard muſt conſtantly keep in their eye the nature and qualities of a ſcale, as well as the principles upon which it is formed.

The unit of the ſcale muſt conſtantly be the ſame, although realized in the metals, or the whole operation fails in the moſt eſſential part. This realizing the unit is like adjuſting a pair of compaſſes to a geometrical ſcale, where the ſmalleſt deviation from the exact opening once given muſt occaſion an incorrect meaſure. The metals, therefore, are to money what a pair of compaſſes is to a geometrical ſcale.

This operation of adjuſting the metals to the money of account implies an exact and determinate proportion of both metals to the money unit, realized in all the ſpecies and denominations of coin, adjuſted to that ſtandard.

The ſmalleſt particle of either metal added to, or taken away from any coin, which repreſent certain determinate parts of the ſcale, overturns the whole ſyſtem of material money. And if, notwithſtanding ſuch variation, theſe coins continue to bear the ſame denominations as before, this will as effectually deſtroy their uſefulneſs in meaſuring the value of things, as it would overturn the uſefulneſs of a pair of compaſſes, to ſuffer the opening to vary, after it is adjuſted to the ſcale repreſenting feet, toiſes, miles, or leagues, by which the diſtances up the plan are to be meaſured.

III. Debaſing the ſtandard is a good term; becauſe it conveys a clear and diſtinct idea. It is diminiſhing the weight of the pure metal contained in that denomination by which a nation reckons, and which we have called the money-unit. Raiſing the ſtandard requires no farther definition, being the direct contrary.

IV. Altering the ſtandard (that is, raiſing or debaſing the value of the money-unit) is like altering the national meaſures or weights. This is beſt diſcovered by comparing the thing altered with things of the ſame nature which have ſuffered no alteration. Thus if the foot of meaſure was altered at once over all England, by adding to it, or taking from it, any proportional part of its ſtandard length, the alteration would be beſt diſcovered, by comparing the new foot with that of Paris, or of any other country, which had ſuffered no alteration. Juſt ſo, if the pound ſterling, which is the Engliſh unit, ſhall be found any how changed, and if the variation it has met with be difficult to aſcertain, becauſe of a complication of circumſtances, the beſt way to diſcover it, will be to compare the former and the preſent value of it with the money of other nations which has ſuffered no variation. This the courſe of exchange will perform with the greateſt exactneſs.

V. Artiſts pretend, that the precious metals, when abſolutely pure from any mixture, are not of ſufficient hardneſe to conſtitute a ſolid and laſting coin. They are found alſo in the mines mixed with other metals of a baſer nature, and the bringing them to a ſtate of perfect purity occaſions an unneceſſary expence. To avoid, therefore, the inconvenience of employing them in all their purity, people have adopted the expedient of mixing them with a *determinate proportion* of other metals, which hurts neither their fuſibility, malleability, beauty, or luſtre. This metal is called *alloy;* and, being conſidered only as a ſupport to the principal metal, is accounted of no value in itſelf. So that eleven ounces of gold, when mixed with one ounce of ſilver, acquires, by that addition, no augmentation of value whatever.

This being the caſe, we ſhall, as much as poſſible, overlook the exiſtence of alloy, in ſpeaking of money, in order to render language leſs ſubject to ambiguity.

Incapacities of the metals to perform the office of an invariable meaſure of value.

I. Were there but one ſpecies of ſuch a ſubſtance as we have repreſented gold and ſilver to be; were there but one metal poſſeſſing the qualities of purity, diviſibility, and durability; the inconveniences in the uſe of it for money would be fewer by far than they are found to be as matters ſtand.

Such a metal might then, by an unlimited diviſion into parts exactly equal, be made to ſerve as a tolerably ſteady and univerſal meaſure. But the rivalſhip between the metals, and the perfect equality which is found between all their phyſical qualities, ſo far as regards purity and diviſibility, render them ſo equally well adapted to ſerve as the common meaſure of value, that they are univerſally admitted to paſs current as money.

What is the conſequence of this? That the one meaſures the value of the other, as well as that of every other thing. Now the moment any meaſure begins to be mea-

ſured

ſured by another, whoſe proportion to it is not phyſically, perpetually, and invariably the ſame, all the uſefulneſs of ſuch a meaſure is loſt. An example will make this plain.

A foot of meaſure is a determinate length. An Engliſh foot may be compared with the Paris foot, or with that of the Rhine; that is to ſay, it may be meaſured by them; and the proportion between their lengths may be expreſſed in numbers; which proportion will be the ſame perpetually. The meaſuring the one by the other will occaſion no uncertainty; and we may ſpeak of lengths by Paris feet, and be perfectly well underſtood by others who are uſed to meaſure by the Engliſh foot, or by the foot of the Rhine.

But ſuppoſe that a youth of twelve years old takes it into his head to meaſure from time to time, as he advances in age, by the length of his own foot, and that he divides this growing foot into inches and decimals: what can be learned from his account of meaſures! As he increaſes in years, his foot, inches, and ſubdiviſions, will be gradually lengthening; and were every man to follow his example, and meaſure by his own foot, then the foot of a meaſure now eſtabliſhed would totally ceaſe to be of any utility.

This is juſt the caſe with the two metals. There is no determinate invariable proportion between their value; and the conſequence of this is, that when they are both taken for meaſuring the value of other things, the things to be meaſured, like lengths to be meaſured by the young man's foot, without changing their relative proportion between themſelves, change however with reſpect to the denominations of both their meaſures. An example will make this plain.

Let us ſuppoſe an ox to be worth three thouſand pounds weight of wheat, and the one and the other to be worth an ounce of gold, and an ounce of gold to be worth exactly fifteen ounces of ſilver: If the caſe ſhould happen, that the proportional value between gold and ſilver ſhould come to be as 14 is to 1, would not the ox, and conſequently the wheat, be eſtimated at leſs in ſilver, and more in gold, than formerly? Farther, would it be in the power of any ſtate to prevent this variation in the meaſure of the value of oxen and wheat, without putting into the unit of their money leſs ſilver and more gold than formerly.

If therefore any particular ſtate ſhould fix the ſtandard of the unit of their money to one ſpecies of the metals, while in fact both the one and the other are actually employed in meaſuring value; does not ſuch a ſtate reſemble the young man, who meaſures all by his growing foot? For if ſilver, for example, be retained as the ſtandard, while it is gaining upon gold one fifteenth additional value; and if gold continue all the while to determine the value of things as well as ſilver, it is plain, that, to all intents and purpoſes, this ſilver-meaſure is lengthening daily, like the young man's foot, ſince the ſame weight of it muſt become every day equivalent to more and more of the ſame commodity; notwithſtanding that we ſuppoſe the ſame proportion to ſubſiſt, without the leaſt variation, between that commodity and every other ſpecies of things alienable

Buying and ſelling are purely conventional, and no man is obliged to give his merchandize at what may be ſuppoſed to be the proportion of its worth. The uſe, therefore of an univerſal meaſure, is, to mark, not only the relative value of the things to which it is applied as a meaſure, but to diſcover in an inſtant the proportion between the value of thoſe, and of every other commodity valued by a determinate meaſure in all the countries of the world.

Were pounds ſterling, livres, florins, piaſtres, *&c.* which are all money of account, invariable in their values, what a facility would it produce in all converſions, what an aſſiſtance to trade! But as they are all limited or fixed to coins, and conſequently vary from time to time, this example ſhews the utility of the invariable meaſure which we have deſcribed.

There is another circumſtance which incapacitates the metals from performing the office of money; the ſubſtance of which the coin is made, is a commodity, which riſes and ſinks in its value with reſpect to other commodities, according to the wants, competition, and caprices of mankind. The advantage, therefore, found in putting an intrinſic value into that ſubſtance which performs the function of money of account, is compenſated by the inſtability of that intrinſic value; and the advantage obtained by the ſtability of paper, or ſymbolical money, is compenſated by the defect it commonly has of not being at all times ſuſceptible of realization into ſolid property or intrinſic value.

In order, therefore, to render material money more perfect, this quality of metal, that is, of a commodity, ſhould be taken from it; and in order to render paper-money more perfect, it ought to be made to circulate upon metallic or land ſecurity.

II. There are ſeveral ſmaller inconveniences accompanying the uſe of the metals, which we ſhall here ſhortly enumerate:

1*mo*. No money made of gold or ſilver can circulate long, without loſing of its weight, although it all along preſerves the ſame denomination. This repreſents the contracting a pair of compaſſes which had been rightly adjuſted to the ſcale.

2*do*. Another inconvenience proceeds from the fabrication of money. Suppoſing the faith of Princes who coin money to be inviolable, and the probity as well as capacity of thoſe to whom they commit the inſpection of the fineneſs of the metals to be ſufficient, it is hardly poſſible for workmen to render every piece exactly of a proper weight, or to preſerve the due proportion between pieces of different denominations; that is to ſay, to make every ten ſixpences exactly of the ſame weight with every crown-piece and every five ſhillings ſtruck in a coinage. In proportion to ſuch inaccuracies, the parts of the ſcale become unequal.

3*tio*. Another inconvenience, and far from being inconſiderable, flows from the expence requiſite for the coining of money. This expence adds to its value as a manufacture, without adding any thing to its weight.

4*to*. The laſt inconvenience is, that by fixing the money of account entirely to the coin without having any independent common meaſure to mark and control theſe deviations from mathematical exactneſs, which are either inſeparable

inseparable from the metals themselves, or from the fabrication of them) the whole measure of value, and all the relative interests of debtors and creditors, become at the disposal not only of workmen in the mint, of Jews who deal in money, of clippers and washers of coin, but they are also entirely at the mercy of princes, who have the right of coinage, and who have frequently also the right of raising or debasing the standard of the coin, according as they find it most for their present and temporary interest.

Methods which may be proposed for lessening the several inconveniences to which material money is liable.

THE inconveniences from the variation in the relative value of the metals to one another, may in some measure be obviated by the following expedients.

1mo. By considering one only as the standard, and leaving the other to seek its own value, like any other commodity.

2do. By considering one only as the standard, and fixing the value of the other from time to time by authority, according as the market-price of the metals shall vary.

3tio. By fixing the standard of the unit according to the mean proportion of the metals, attaching it to neither; regulating the coin accordingly; and upon every considerable variation in the proportion between them, either to make a new coinage, or to raise the denomination of one of the species, and lower it in the other, in order to preserve the unit exactly in the mean proportion between the gold and silver.

4to. To have two units, and two standards, one of gold, and one of silver, and to allow every body to stipulate in either.

5to. Or last of all, to oblige all debtors to pay one half in gold, and one half in the silver standard.

Variations to which the value of the money-unit is exposed from every disorder in the coin.

LET us suppose, at present, the only disorder to consist in a want of the due proportion between the gold and silver in the coin.

This proportion can only be established by the market-price of the metals; because an augmentation and rise in the demand for gold or silver has the effect of augmenting the value of the metal demanded. Let us suppose, that to day one pound of gold may buy fifteen pounds of silver; if to-morrow there be a high demand for silver, a competition among merchants to have silver for gold will ensue; they will contend who shall get the silver at the rate of fifteen pounds for one of gold: this will raise the price of it; and in proportion to their views of profit, some will accept of less than the fifteen pounds. This is plainly a raise in the silver, more properly than a fall in the gold; because it is the competition for the silver which has occasioned the variation in the former proportion between the metals.

Let us now suppose, that a state, having with great exactness examined the proportion of the metals in the market, and having determined the precise quantity of each for realizing or representing the money-unit, shall execute a most exact coinage of gold and silver coin. As long as that proportion continues unvaried in the market, no inconvenience can result from that quarter, in making use of metals for money of account.

But let us suppose the proportion to change; that the silver, for example, shall rise in its value with regard to gold; will it not follow, from that moment, that the unit realized in the silver, will become of more value than the unit realized in the gold coin?

But as the law has ordered them to pass as equivalents for one another, and as debtors have always the option of paying in what legal coin they think fit, will they not all chuse to pay in gold, and will not then the silver coin be melted down or exported, in order to be sold as bullion, above the value it bears when it circulates in coin? Will not this paying in gold also really diminish the value of the money unit, since upon this variation every thing must sell for more gold than before, as we have already observed?

Consequently, merchandize which have not varied in their relative value to any other thing but to gold and silver, must be measured by the mean proportion of the metals; and the application of any other measure to them is altering the standard. If they are measured by the gold, the standard is debased; if by silver, it is raised.

If, to prevent the inconvenience of melting down the silver, the state shall give up affixing the value of their unit to both species at once, and shall fix it to one, leaving the other to seek its price as any other commodity; in that case, no doubt, the melting down of the coin will be prevented; but will ever this restore the value of the money-unit to its former standard? Would it, for example, in the foregoing supposition, raise the debased value of the money-unit in the gold coin, if that species were declared to be the standard? It would indeed render silver coin purely a merchandize, and, by allowing it to seek its value, would certainly prevent it from being melted down as before; because the pieces would rise conventionally in their denomination; or an agio, as it is called, would be taken in payments made in silver; but the gold would not, on that account, rise in its value, or begin to purchase any more merchandize than before. Were therefore the standard fixed to the gold, would not this be an arbitrary and a violent revolution in the value of the money-unit, and a debasement of the standard?

If, on the other hand, the state should fix the standard to the silver, which we suppose to have risen in its value, would that ever sink the advanced value which the silver coin had gained above the worth of the former standard unit? and would not this be a violent and an arbitrary revolution in the value of the money unit, and a raising of the standard?

The only expedient, therefore, is, in such a case, to fix the numerary unit to neither of the metals, but to contrive a way to make it fluctuate in a mean proportion between them; which is in effect the introduction of a pure ideal money of account.

The regulation of fixing the unit by the mean proportion, ought to take place at the instant the standard unit is affixed with exactness both to the gold and silver. If

it

it be introduced long after the market proportion between the metals has deviated from the proportion eſtabliſhed in the coin; and if the new regulation is made to have a retroſpect, with regard to the acquitting of permanent contracts entered into, while the value of the money-unit had attached itſelf to the loweſt currency, in conſequence of the principle above laid down; then the reſtoring the money-unit to that ſtandard where it ought to have remained (to wit, to the mean proportion) is an injury to all debtors who have contracted ſince the time that the proportion of the metals began to vary.

This is clear from the former reaſoning. The moment the market-price of the metals differs from that in the coin, every one who has payments to make, pays in that ſpecies which is the higheſt rated in the coin; conſequently, he who lends, lends in that ſpecies. If after the contract, therefore, the unit is carried up to the mean proportion, this muſt be a loſs to him who had borrowed.

From this we may perceive, why there is leſs inconvenience from the varying of the proportion of the metals, where the ſtandard is fixed to one of them, than when it is fixed to both. In the firſt caſe, it is at leaſt uncertain whether the *ſtandard* or the *merchandize-ſpecies* is to riſe; conſequently it is uncertain whether the debtors or the creditors are to gain by a variation. If the *ſtandard* ſpecies ſhould riſe, the creditors will gain; if the *merchandize ſpecies* riſes, the debtors will gain; but when the unit is attached to both ſpecies, then the creditors never can gain, let the metals vary as they will: if ſilver riſes, then debtors will pay in gold; if gold riſes, debtors will pay in ſilver. But whether the unit be attached to one or to both ſpecies, the infallible conſequence of a variation is, that one half of the difference is either gained or loſt by debtors and creditors. The invariable unit is conſtantly the mean proportional between the two meaſures.

How the variations in the intrinſic value of the unit of money muſt affect all the domeſtic intereſt of a Nation.

If the changing the content of the buſhel by which grain is meaſured, would affect the intereſt of thoſe who are obliged to pay, or who are intitled to receive, a certain number of buſhels of grain for the rent of lands; in the ſame manner muſt every variation in the value of the unit of accompt affect all perſons who, in permanent contracts, are obliged to make payments, or who are intitled to receive ſums of money ſtipulated in multiples or in fractions of that money unit.

Every variation, therefore, upon the intrinſic value of the money unit, has the effect of benefiting the claſs of creditors, at the expence of debtors, or *vice verſa*

This conſequence is deduced from an obvious principle. Money is more or leſs valuable in proportion as it can purchaſe more or leſs of every kind of merchandize. Now without entering anew into the cauſes of the riſe and fall of prices, it is agreed upon all hands, that whether an augmentation of the general maſs of money in circulation has the effect of raiſing prices in general, or not, any augmentation of the quantity of the metals appointed to be put into the money-unit, muſt at leaſt affect the value of that money-unit, and make it purchaſe more of any commodity than before; that is to ſay, if 113 grains of fine gold, the preſent weight of a pound ſterling in gold, can buy 113 pounds of flour; were the pound ſterling raiſed to 114 grains of the ſame metal, it would buy 114 pounds of flour; conſequently, were the pound ſterling augmented by one grain of gold, every miller who paid a rent of ten pounds a year, would be obliged to ſell 1140 pounds of his flour, in order to procure 10 pounds to pay his rent, in place of 1130 pounds of flour which he ſold formerly to procure the ſame ſum; conſequently, by this innovation, the miller muſt loſe yearly ten pounds of flour, which his maſter conſequently muſt gain. From this example, it is plain, that every augmentation of metals put into the pound ſterling, either of ſilver or gold, muſt imply an advantage to the whole claſs of creditors who are paid in pounds ſterling, and conſequently muſt be a proportional loſs to all debtors who muſt pay by the ſame denomination.

Of the diſorder in the Britiſh coin, for ſo far as it occaſions the melting down or the exporting of the ſpecie.

The defects in the Britiſh coin are three.

1mo. The proportion between the gold and ſilver in it is found to be as 1 to $15\frac{2}{10}$, whereas the market price may be ſuppoſed to be nearly as 1 to $14\frac{1}{2}$.

2do. Great part of the current money is worn and light.

3tio. From the ſecond defect proceeds the third, to wit, that there are ſeveral currencies in circulation which paſs for the ſame value, without being of the ſame weight.

4to. From all theſe defects reſults the laſt and greateſt inconvenience, to wit, that ſome innovation muſt be made, in order to ſet matters on a right footing.

The Engliſh, beſides the unit of their money which they call the pound ſterling, have alſo the unit of their weight for weighing the precious metals.

This is called the pound troy, and conſiſts of 12 ounces, every ounce of 20 penny-weight, and every penny-weight of 24 grains. The pound troy, therefore, conſiſts of 240 penny-weight, and 5760 grains.

The fineneſs of the ſilver is reckoned by the number of ounces and penny-weights of the pure metals in the pound troy of the compoſed maſs; or in other words, the pound troy, which contains 5760 grains of ſtandard ſilver, contains 5328 grains of fine ſilver, and 432 grains of copper, called alloy.

Thus ſtandard ſilver is 11 ounces 2 penny-weights of fine ſilver in the pound troy to 18 penny-weights copper, or 111 parts fine ſilver to 9 parts alloy.

Standard gold is 11 ounces fine to one ounce ſilver or copper employed for alloy, which together make the pound troy; conſequently, the pound troy of ſtandard gold, contains 5280 grains fine, and 480 grains alloy, which alloy is reckoned of no value.

This pound of ſtandard ſilver is ordered, by ſtatute of the 43d of Elizabeth, to be coined into 62 ſhillings, 20 of which make the pound ſterling; conſequently the 20 ſhillings contain 1718.7 grains of fine ſilver, and 1858.06 ſtandard ſilver.

The pound troy of ſtandard gold, $\frac{11}{12}$ fine, is ordered by

by an act of King Charles II. to be cut into 44 $\frac{1}{2}$ guineas; that is to ſay, every guinea contains 129.43 grains of ſtandard gold, and 118.644 of fine gold; and the pound ſterling, which is $\frac{20}{21}$ of the guinea, contains 112.994, which we may ſtate at 113 grains of fine gold.

The coinage in England is entirely defrayed at the expence of the ſtate. The mint price for the metals is the very ſame with the price of the coin. Whoever carries to the mint an ounce of ſtandard ſilver, receives for it in ſilver coin 5*s.* 2*d.* or 62*d:* whoever carries an ounce of ſtandard gold receives in gold coin 3*l.* 17*s.* 10*d* $\frac{1}{2}$. the one and the other making exactly an ounce of the ſame fineneſs with the bullion. Coin, therefore, can have no value in the market above bullion; conſequently, no loſs can be incurred by thoſe who melt it down.

When the guinea was firſt ſtruck, the government (not inclining to fix the pound ſterling to the gold coin of the nation) fixed the guinea at 20 ſhillings, (which was then below its proportion to the ſilver) leaving it to ſeek its own price above that value, according to the courſe of the market.

By this regulation no harm was done to the Engliſh ſilver ſtandard; becauſe the guinea, or 118.644 grains fine gold being worth more, at that time, than 20 ſhillings, or 1718.7 grains fine ſilver, no debtor would pay with gold at its ſtandard value, and whatever it was received for above that price was purely conventional.

Accordingly guineas ſought their own price until the year 1728, that they were fixed a-new, not below their value as at firſt, but at what was then reckoned their exact value, according to the proportion of the metals, to wit, at 21 ſhillings, and at this they were ordered to paſs current in all payments.

This operation had the effect of making the gold a ſtandard as well as the ſilver. Debtors then paid indifferently in gold as well as in ſilver, becauſe both were ſuppoſed to be of the ſame intrinſic as well as current value; in which caſe no inconvenience could follow upon this regulation. But, in time, ſilver came to be more demanded; the making of plate began to prevail more than formerly, and the exportation of ſilver to the Eaſt Indies increaſing yearly, made the demand for it greater, or perhaps brought its quantity to be proportionally leſs than before. This changed the proportion of the metals; and by ſlow degrees they have come from that of 1 to 15.2 (the proportion they were ſuppoſed to have when the guineas were fixed and made a lawful money at 21 ſhillings) to that of 14.5 the preſent *ſuppoſed* proportion.

The conſequence of this has been, that the ſame guinea which was worth 1804.6 grains fine ſilver, at the time it was fixed at 21 ſhillings, is now worth no more than 1719.9 grains of fine ſilver according to the proportion of 14$\frac{1}{2}$ to 1.

Conſequently, debtors, who have always the option of the legal ſpecies in paying their debts, will pay pounds ſterling no more in ſilver but in gold; and as the gold pounds they pay in, are not intrinſically worth the ſilver pounds they paid in formerly, according to the ſtatute of Elizabeth, it follows that the pound ſterling in ſilver is really no more the ſtandard, ſince no body will pay at that rate, and ſince no body can be compelled to do it.

Beſides this want of proportion between the metals, the ſilver coined before the reign of George I. is now become light by circulation; and the guineas coined by all the Princes ſince Charles II. paſs by tale, though many of them are conſiderably diminiſhed in their weight.

Let us now examine what profit the want of proportion and the want of weight in the coin can afford to the money-jobbers, in melting it down or exporting it.

Did every body conſider coin only as the meaſure for reckoning value, without attending to its value as a metal, the deviations of gold and ſilver coin from perfect exactneſs either as to proportion or weight would occaſion little inconvenience.

Great numbers indeed, in every modern ſociety, conſider coin in no other light, than that of money of accompt; and have great difficulty to comprehend what difference any one can find between a light ſhilling and a heavy one; or what inconvenience there can poſſibly reſult from a guinea's being ſome grains of fine gold too light to be worth 21 ſhillings ſtandard weight. And did every one think in the ſame way, there would be no occaſion for coin of the precious metals at all; leather, copper, iron, or paper, would keep the reckoning as well as gold and ſilver.

But although there be many who look no farther than at the ſtamp on the coin, there are others whoſe ſole buſineſs it is to examine its intrinſic worth as a commodity, and to profit of every irregularity in the weight and proportion of metals.

By the very inſtitution of coinage, it is implied, that every piece of the ſame metal, and ſame denomination with regard to the money-unit, ſhall paſs current for the ſame value.

It is, therefore, the employment of money-jobbers, to examine, with a ſcrupulous exactneſs, the preciſe weight of every piece of coin which comes into their hands.

The firſt object of their attention, is, the price of the metals in the market: a jobber finds, at preſent, that with 14.5 pounds of fine ſilver bullion, he can buy one pound of fine gold bullion.

He therefore buys up with gold coin, all the new ſilver as faſt as it is coined, of which he can get at the rate of 15.2 pounds for one in gold; theſe 15.2 pounds ſilver coin he melts down into bullion, and converts that back into gold bullion, giving at the rate of only 14.5 pounds for one.

By this operation he remains with the value of $\frac{7}{10}$ of one pound weight of ſilver bullion clear profit upon the 15$\frac{1}{2}$ pounds he bought; which $\frac{7}{10}$ is really loſt by the man who inadvertently coined ſilver at the mint, and gave it to the money-jobber for his gold. Thus the ſtate loſes the expence of the coinage, and the public the convenience of change for their guineas.

But here it may be aſked, Why ſhould the money-jobber melt down the ſilver coin? can he not buy gold with it as well without melting it down? He cannot; becauſe when it is in coin, he cannot avail himſelf of its being new and weighty. Coin goes by tale, not by weight; therefore, were he to come to market with his new ſilver coin, gold bullion being ſold at the mint price, we ſhall ſuppoſe, viz. at 3*l.* 17*s.* 10$\frac{1}{2}$*d.* ſterling money

per

per ounce, he would be obliged to pay the price of what he bought with heavy money, which he can equally do with light.

He therefore melts down the new ſilver coin, and ſells it for bullion, at ſo many pence an ounce, the price of which bullion is, in the Engliſh market, always above the price of ſilver at the mint, for the reaſons now to be given.

When you ſell ſtandard ſilver bullion at the mint, you are paid in weighty money; that is, you receive for your bullion the very ſame weight in ſtandard coin; the coinage coſts nothing: but when you ſell bullion in the market, you are paid in worn out ſilver, in gold, in bank notes, in ſhort, in every ſpecies of lawful current money. Now all theſe payments have ſome defect: the ſilver you are paid with is worn and light; the gold you are paid with is over-rated, and perhaps alſo light; and the bank notes muſt have the ſame value with the ſpecie with which the bank pays them; that is, with light ſilver or over-rated gold.

It is for theſe reaſons, that ſilver bullion, which is bought by the mint at 5 *s.* 2 *d. per* ounce of heavy ſilver money, may be bought at market at 65 pence the ounce in light ſilver, over-rated gold, or bank notes, which is the ſame thing.

Farther, we have ſeen how the impoſition of coinage has the effect of raiſing coin above the value of bullion, by adding a value to it which it had not as a metal.

Juſt ſo, when the unit is once affixed to certain determined quantities of both metals, if one of the metals ſhould afterwards riſe in value in the market, the coin made of that metal muſt loſe a part of its value as coin, although it retains it as a metal. Conſequently, as in the firſt caſe, it acquired an additional value by being coined, it muſt now acquire an additional value by being melted down. From this we may conclude, that when the ſtandard is affixed to both the metals in the coin, and when the proportion of that value is not made to follow the price of the market, that ſpecies which riſes in the market is melted down, and the bullion is ſold for a price as much exceeding the mint price as the metal has riſen in its value.

If, therefore, in England, the price of ſilver bullion is found to be at 65 pence the ounce, while at the mint it is rated at 62; this proves that ſilver has riſen $\frac{3}{65}$ above the proportion obſerved in the coin, and that all coin of ſtandard weight may conſequently be melted down with a profit of $\frac{3}{65}$. But as there are ſeveral other circumſtances to be attended to which regulate and influence the price of bullion, we ſhall here paſs them in review, the better to diſcover the nature of this diſorder in the Engliſh coin, and the advantages which money-jobbers may draw from it.

The price of bullion, like that of every other merchandize, is regulated by the value of the money it is paid with.

If bullion, therefore, ſells in England for 65 pence an ounce, paid in ſilver coin, it muſt ſell for 65 ſhillings the pound troy; that is to ſay, the ſhillings it is commonly paid with do not exceed the weight of $\frac{1}{65}$ of a pound troy: for if the 65 ſhillings with which the pound of bullion is paid weighed more than a pound troy, it would be a ſhorter and better way for him who wants bullion to melt down the ſhillings and make uſe of the metal, than to go to market with them in order to get leſs.

We may, therefore, be very certain, that no man will buy ſilver bullion at 65 pence an ounce, with any ſhilling which weighs above $\frac{1}{65}$ of a pound troy

We have gone upon the ſuppoſition that the ordinary price of bullion in the Engliſh market is 65 pence *per* ounce. This has been done upon the authority of ſome late writers on this ſubject: it is now proper to point out the cauſes which may make it deviate from that value.

I. It may vary, and certainly will vary, in the price, according as the currency is better or worſe. When the expences of a war, or a wrong balance of trade, have carried off a great many heavy guineas, it is natural that bullion ſhould riſe; becauſe then it will be paid for more commonly in light gold and ſilver; that is to ſay, with pounds ſterling, below the value of 113 grains fine gold, the worth of the pound ſterling in new guineas.

II. This wrong balance of trade, or a demand for bullion abroad, becoming very great, may occaſion a ſcarcity of the metals in the market, as well as a ſcarcity of the coin; conſequently, an advanced price muſt be given for it in proportion to the greatneſs and height of the demand. In this caſe, both the ſpecie and the bullion muſt be bought with paper. But the riſe in the price of bullion proceeds from the demand for the metals, and the competition between merchants to procure them, and not becauſe the paper given as the price is at all of inferior value to the ſpecie. The leaſt diſcredit of this kind would not tend to diminiſh the value of the paper; it would annihilate it at once. Therefore, ſince the metals muſt be had, and that the paper cannot ſupply the want of them when they are to be exported, the price riſes in proportion to the difficulties in finding metals elſewhere than in the Engliſh market.

III. A ſudden call for bullion, for the making of plate. A goldſmith can well afford to give 67 pence for an ounce of ſilver, that is to ſay, he can afford to give one pound of gold for 14 pounds of ſilver, and perhaps for leſs, notwithſtanding that what he gives be more than the ordinary proportion between the metals, becauſe he indemniſies himſelf amply by the price of his workmanſhip: juſt as a tavern keeper will pay any price for a fine fiſh, becauſe, like the goldſmith, he buys for other people.

IV. The mint price has as great an effect in bringing down the price of bullion, as exchange has in raiſing it. In countries where the metals in the coin are juſtly proportioned, where all the currencies are of legal weight, and where coinage is impoſed, the operations of trade make the price of bullion conſtantly to fluctuate between the value of the coin and the mint price of the metals.

Now let us ſuppoſe that the current price of ſilver bullion in the market is 65 pence the ounce, paid in lawful money, no matter of what weight, or of what metal. Upon this the money jobber falls to work. All ſhillings which are above $\frac{1}{65}$ of a pound troy, he throws into his

melting pot, and ſells them as bullion, for 65*d. per* ounce; all thoſe which are below that weight he carries to market, and buys bullion with them, at 65 pence *per* ounce.

What is the conſequence of this?

That thoſe who ſell the bullion, finding the ſhillings which the money-jobber pays with perhaps not above $\frac{1}{66}$ of a pound troy, they on their ſide raiſe the price of their bullion to 66 pence the ounce.

This makes new work for the money-jobber; for he muſt always gain. He now weighs all ſhillings as they come to hand; and as formerly he threw into his melting-pot thoſe only which were worth more than $\frac{1}{65}$ of a pound troy, he now throws in all that are in value above $\frac{1}{66}$. He then ſells the melted ſhillings at 66 pence the ounce, and buys bullion with the light ones at the ſame price.

This is the conſequence of ever permitting any ſpecies of coin to paſs by the authority of the ſtamp, without controlling it at the ſame time by the weight: and this is the manner in which money-jobbers gain by the currency of light money.

It is no argument againſt this expoſition of the matter to ſay, that ſilver bullion is ſeldom bought with ſilver coin; becauſe the pence in new guineas are worth no more than the pence of ſhillings of 65 in the pound troy: that is to ſay, that 240 pence contained in $\frac{20}{21}$ of a new guinea, and 240 pence contained in 28 ſhillings of 65 to the pound troy differ no more in the intrinſic value than 0.88 of a grain of fine ſilver upon the whole, which is a mere trifle.

Whenever, therefore, ſhillings come below the weight of $\frac{1}{65}$ of a pound troy, then there is an advantage in changing them for new guineas: and when that is the caſe, the new guineas will be melted down, and profit will be found in ſelling them for bullion, upon the principles we have juſt been explaining.

We have already given a ſpecimen of the domeſtic operations of the money-jobbers; but theſe are not the moſt prejudicial to national concerns. The jobbers may be ſuppoſed to be Engliſhmen; and in that caſe the profit they make remains at home: but whenever there is a call for bullion to pay the balance of trade, it is evident that this will be paid in ſilver coin, never in gold, if heavy ſilver can be got; and this again carries away the ſilver coin, and renders it at home ſo rare, that great inconveniencies are found for want of the leſſer denominations of it. The loſs, however, here is confined to an inconvenience; becauſe the balance of trade being a debt which muſt be paid, we do not conſider the exportation of the ſilver for that purpoſe as any conſequence of the diſorder of the coin. But beſides this exportation which is neceſſary, there are others which are arbitrary, and which are made only with a view to profit of the wrong proportion.

When the money jobbers find difficulty in carrying on the traffic we have deſcribed, in the Engliſh market, becauſe of the competition among themſelves, they carry the ſilver coin out of the country, and ſell it abroad for gold, upon the ſame principles that the Eaſt India company ſend ſilver to China, in order to purchaſe gold.

It may be demanded, what hurt this trade can do to England, ſince thoſe who export ſilver bring back the ſame value in gold? Were this trade carried on by natives, there would be no loſs; becauſe they would bring home gold for the whole intrinſic value of the ſilver. But if we ſuppoſe foreigners ſending over gold to be coined at the Engliſh mint, and changing that gold into Engliſh ſilver coin, and then carrying off this coin, it is plain that they muſt gain the difference, as well as the money jobbers. But it may be anſwered, that having given gold for ſilver at the rate of the mint, they have given value for what they have received. Very right; but ſo did Sir Hans Sloane, when he paid five guineas for an overgrown tod: he got value for his money; but it was value only to himſelf. Juſt ſo, whenever the Engliſh government ſhall be obliged to reſtore the proportion of the metals, (as they muſt do,) this operation will annihilate that imaginary value which they have hitherto ſet upon gold; which imagination is the only thing which renders the exchange of their ſilver againſt the foreign gold equal.

But it is farther objected, that foreigners cannot carry off the heavy ſilver; becauſe there is none to carry off. Very true; but then they have carried off a great quantity already: or if the Engliſh Jews have been too ſharp to allow ſuch a profit to fall to ſtrangers, (which may or may not have been the caſe,) then this diſorder is an effectual ſtop to any more coinage of ſilver for circulation.

Of the diſorder in the Britiſh coin, ſo far as it effects the value of the pound ſterling currency.

FROM what has been ſaid, it is evident, that there muſt be found in England two legal pounds ſterling, of different values; the one worth 113 grains of fine gold, the other worth 1718.7 grains of fine ſilver. We call them different; becauſe theſe two portions of the precious metals are of different values all the over Europe.

But beſides theſe two different pounds ſterling, which the change in the proportion of the metals have created, the other defects of the circulating coin produce ſimilar effects. The guineas coined by all the Princes ſince K. Charles II. have been of the ſame ſtandard weight and fineneſs, $44\frac{1}{2}$ in a pound troy of ſtandard gold $\frac{11}{12}$ fine: theſe have been conſtantly wearing ever ſince they have been coined; and in proportion to their wearing they are of leſs value.

If, therefore, the new guineas are below the value of a pound ſterling in ſilver, ſtandard weight, the old muſt be of leſs value ſtill. Here then is another currency, that is, another pound ſterling; or indeed, more properly ſpeaking, there are as many different pounds ſterling, as there are guineas of different weights. This is not all; the money jobbers having carried off all the weighty ſilver, that which is worn with uſe, and reduced even below the ſtandard of gold, forms one currency more, and totally deſtroys all determinate proportion between the money unit and the currencies which are ſuppoſed to repreſent it.

It may be aſked, how, at this rate, any ſilver has remained in England? It is anſwered, that the few weighty ſhillings which ſtill remain in circulation, have marvelouſly eſcaped the hands of the money jobbers; and as for the reſt, the rubbing and wearing of theſe pieces has done

done what the ſtate might have done; that is to ſay, it has reduced them to their due proportion with the lighteſt gold.

The diſorder, therefore, of the Engliſh coin has rendered the ſtandard of a pound ſterling quite uncertain. To ſay that it is 1718.7 grains of fine ſilver, is quite ideal. Who are paid in ſuch pounds? To ſay that it is 113 grains of pure gold, may alſo not be true; becauſe there are many currencies worſe than the new guineas.

What then is the conſequence of all this diſorder? What effect has it upon the current value of a pound ſterling? And which way can the value of that be determined?

The operations of trade bring value to an equation, notwithſtanding the greateſt irregularities poſſible, and ſo in fact a pound ſterling has acquired a determinate value over all the world by the means of foreign exchange. This is a kind of ideal ſcale for meaſuring the Britiſh coin, although it has not all the properties of that deſcribed above.

Exchange conſiders the pound ſterling as a value determined according to the combination of the values of all the different currencies, in proportion as payments are made in the one or the other; and as debtors generally take care to pay in the worſt ſpecies they can, it conſequently follows, that the value of the pound ſterling ſhould fall to that of the loweſt currency.

Were there a ſufficient quantity of worn gold and ſilver to acquit all bills of exchange, the pound ſterling would come down to the value of them; but if the new gold be alſo neceſſary for that purpoſe, the value of it muſt be proportionally greater.

All theſe combinations are liquidated and compenſated with one another, by the operations of trade and exchange: and the pound ſterling, which is ſo different in itſelf, becomes thereby, in the eyes of commerce, a determinate unit, ſubject however to variations, from which it never can be exempted.

Exchange, therefore, is one of the beſt meaſures for valuing a pound ſterling, preſent currency. Here occurs a queſtion:

Does the great quantity of paper money in England tend to diminiſh the value of the pound ſterling?

We anſwer in the negative. *Paper money* is juſt as good as gold or ſilver money, and no better. The variation of the ſtandard, we have already ſaid, muſt influence the intereſts of debtors and creditors proportionally every where. From this it follows, that all augmentation of the value of the money unit in the ſpecie muſt hurt the debtors in the paper money; and all diminutions, on the other hand, muſt hurt the creditors in the paper money as well as every where elſe. The payments, therefore, made in paper money, never can contribute to the regulation of the ſtandard of the pound ſterling; it is the ſpecie received in liquidation of that paper money which alone can contribute to mark the value of the Britiſh unit; becauſe it is affixed to nothing elſe.

From this we may draw a principle, "That in countries where the money unit is entirely affixed to the coin, the actual value of it is not according to the legal ſtandard of that coin, but according to the mean proportion of the actual worth of thoſe currencies in which debts are paid.

From this we ſee the reaſon why the exchange between England and all other trading towns in Europe has long appeared ſo unfavourable. People calculate the real par, upon the ſuppoſition that a pound ſterling is worth 1718.7 grains troy of fine ſilver, when in fact the currency is not perhaps worth 1638, the value of a new guinea in ſilver, at the market proportion of 1 to 14.5; that is to ſay, the currency is but 95.3. *per cent* of the ſilver ſtandard of the 43d of Elizabeth. No wonder then if the exchange be thought unfavourable.

From the principle we have juſt laid down, we may gather a confirmation of what we advanced concerning the cauſe of the advanced price of bullion in the Engliſh market.

When people buy bullion with current money at a determinate price, that operation, in conjunction with the courſe of exchange, ought naturally to mark the actual value of the pound ſterling with great exactneſs.

If therefore the price of ſtandard bullion in the Engliſh market, when no demand is found for the exportation of the metals, that is to ſay, when paper is found for paper upon exchange, and when merchants verſed in theſe matters judge exchange (that is, remittances) to be at par, if then, ſilver bullion cannot be bought at a lower price than 65 pence the ounce, it is evident that this bullion might be bought with 65 pence in ſhillings, of which 65 might be coined out of the pound troy Engliſh ſtandard ſilver; ſince 65 per ounce implies 65 ſhillings for the 12 ounces or pound troy.

This plainly ſhews how ſtandard ſilver bullion ſhould ſell for 65 pence the ounce, in a country where the ounce of ſtandard ſilver in the coin is worth no more than 62; and were the market price of bullion to ſtand uniformly at 65 pence *per* ounce, that would ſhew the value of the pound ſterling to be tolerably fixed. All the heavy ſilver coin is now carried off; becauſe it was intrinſically worth more than the gold it paſſed for in currency. The ſilver therefore which remains is worn down to the market proportion of the metals, as has been ſaid; that is to ſay, 20 ſhillings in ſilver currency are worth 113 grains of fine gold, at the proportion of 1 to 14.5 between gold and ſilver. Now,

as 1 is to 14.5, ſo is 113 to 1638.

ſo the 20 ſhillings current weigh but 1638 grains fine ſilver, inſtead of 1718.7, which they ought to do according to the ſtandard.

Now let us ſpeak of ſtandard ſilver, ſince we are examining how far the Engliſh coin muſt be worn by uſe.

The pound troy contains 5760 grains. This, according to the ſtandard, is coined into 62 ſhillings; conſequently, every ſhilling ought to weigh 92.9 grains. Of ſuch ſhillings it is impoſſible that ever ſtandard bullion ſhould ſell at above 62 pence *per* ounce. If therefore ſuch bullion ſells for 65 *pence*, the ſhillings with which it is bought muſt weigh no more than 88.64 grains ſtandard ſilver; that is, they muſt loſe 4.29 grains, and are reduced to $\frac{1}{65}$ of a pound troy.

But it is not neceſſary that bullion be bought with ſhillings; no ſtipulation of *price* is ever made farther, than at ſo many pence ſterling *per* ounce. Does not this virtually determine the value of ſuch currency with regard

gard to all the currencies in Europe? Did a Spaniard, a Frenchman, or a Dutchman, know the exact quantity of silver bullion which can be bought in the London market for a pound sterling, would he inform himself any farther as to the intrinsic value of that money-unit; would he not understand the value of it far better from that circumstance than by the course of any exchange, since exchange does not mark the intrinsic value of money, but only the value of that money transported from one place to another?

The price of bullion, therefore, when it is not influenced by extraordinary demand, (such as for the payment of a balance of trade, or for making an extraordinary provision of plate) but when it stands at what every body knows to be meant by the common market price, is a very tolerable measure of the value of the *actual* money standard in any country.

If it be therefore true, that a pound sterling cannot purchase above 1638 grains of fine silver bullion, it will require not a little logic to prove that it is really, or has been for these many years, worth any more; notwithstanding that the standard weight of it in England is regulated by the laws of the kingdom at 1718.7 grains of fine silver.

If to this valuation of the pound sterling drawn from the price of bullion, we add the other drawn from the course of exchange; and if by this we find, that when paper is found for paper upon exchange, a pound sterling cannot purchase above 1638 grains of fine silver in any country in Europe; upon these two authorities we may very safely conclude (as to the matter of fact at least.) that the pound sterling is not worth more, either in London or in any other trading city; and if this be the case, it is just worth 20 shillings of 65 to the pound troy.

If therefore the mint were to coin shillings at that rate, and pay for silver bullion at the market price, that is, at the rate of 65 pence *per* ounce in those new coined shillings, they would be in proportion to the gold; silver would be carried to the mint equally with gold, and would be as little subject to be exported or melted down.

It may be inquired in this place, how far the coining the pound troy into 65 shillings is contrary to the laws of England?

The moment a state pronounces a certain quantity of gold to be worth a certain quantity of silver, and orders these respective quantities of each metal to be received as equivalents of each other, and as lawful money in payments, that moment gold is made a standard as much as silver. If therefore too small a quantity of gold be ordered or permitted to be considered as an equivalent for the unit, the silver standard is from that moment debased; or indeed, more properly speaking, all silver money is from that moment proscribed; for who, from that time, will ever pay in silver, when he can pay cheaper in gold? Gold, therefore, by such a law, is made the standard, and all declarations to the contrary are against the matter of fact.

Were the king, therefore, to coin silver at 65 shillings in the pound, it is demonstration, *that by such an act* he would commit no adulteration upon the standard: the adulteration is already committed. The standard has descended to where it is, by slow degrees, and by the operation of political causes only; and nothing prevents it from falling lower, but the standard of the gold coin. Let guineas be now left to seek their value as they did formerly, and let light silver continue to go by tale, we shall see the guineas up at 30 shillings in 20 years time, as was the case in 1695.

It is as absurd to say that the standard of Queen Elizabeth has not been debased by enacting that the English unit shall be acquitted with 113 grains of fine gold, as it would be to affirm that it would not be debased from what it is at present by enacting that a pound of butter should every where be received in payment for a pound sterling; although the pound sterling should continue to consist of 3 ounces, 17 penny-weights, and 10 grains of standard silver, according to the statute of the 43d of Elizabeth. In that case most debtors would pay in butter, and silver would, as at present, acquire a conventional value as a metal, but would be looked upon no longer as a standard, or as money.

If therefore, by the law of England, a pound sterling must consist of 1718.7 grains troy of fine silver; by the law of England also, 113 grains of gold must be of the same value: but no law can establish that proportion; consequently, in which ever way a reformation be brought about, some law must be reversed; consequently, expediency, and not compliance with law, must be the motive in reforming the abuse.

From what has been said, it is not at all surprising that the pound sterling should in fact be reduced nearly to the value of the gold. Whether it ought to be kept at that value is another question. All that we here decide, is, that coining the pound troy into 65 shillings would restore the proportion of the metals, and render both species common in circulation. But restoring the weight and proportion of the coin is not the difficulty which prevents a reformation of the English coinage.

Circumstances to be attended to in a new regulation of the British coin.

To people who do not understand the nature of such operations, it may have an air of justice to support the unit at what is commonly believed to be the standard of Queen Elizabeth, to wit, at 1718.5 grains of fine silver.

The regulating the standard of both silver and gold to $\frac{11}{12}$ fine, and the pound sterling to four ounces standard silver, as it stood during the reign of Queen Mary I. has also its advantages, as Mr Harris has observed. It makes the crown piece to weigh just one ounce, the shilling four penny weight, and the penny eight grains; consequently, were the new statute to bear, that the weight of the coin should regulate its currency upon certain occasions, the having the pieces adjusted to certain aliquot parts of weight would make weighing easy, and would accustom the common people to judge of the value of money by its weight, and not by the stamp.

In that case, there might be a conveniency in striking the gold coins of the same weight with the silver; because the proportion of their values would then constantly be the same with the proportion of the metals. The gold crowns would be worth at present, *3 l. 12 s. 6 d.* the half

half crowns 1 *l.* 16 *s.* 3 *d.* the gold ſhillings 14 *s.* and 6*d.* and the half 7 *s.* and 3 *d.* This was anciently the practice in the Spaniſh mints.

The intereſts within the ſtate can be nowiſe perfectly protected but by permitting converſions of value from the old to the new ſtandard, whatever it be, and by regulating the footing of ſuch converſions by act of parliament, according to circumſtances.

For this purpoſe, we ſhall examine thoſe intereſts which will chiefly merit the attention of government, when they form a regulation for the future of acquitting permanent contracts already entered into. Such as may be contracted afterwards will naturally follow the new ſtandard.

The landed intereſt is, no doubt, the moſt conſiderable in the nation. Let us therefore examine, in the firſt place, what regulations it may be proper to make, in order to do juſtice to this great claſs, with reſpect to the land-tax on one hand, and with reſpect to their leſſees on the other.

The valuation of the lands of England was made many years ago, and reaſonably ought to be ſupported at the real value of the pound ſterling at that time, according to the principles already laid down. The general valuation, therefore, of the whole kingdom will riſe according to this ſcheme. This will be conſidered as an injuſtice; and no doubt it would be ſo, if, for the future, the land tax be impoſed as heretofore, without attending to this circumſtance; but as that impoſition is annual, as it is laid on by the landed intereſt itſelf, who compoſe the parliament, it is to be ſuppoſed that this great claſs will at leaſt take care of their own intereſt.

Were the valuation of the lands to be ſtated according to the valuation of the pound ſterling of 1718.7 grains of ſilver, which is commonly ſuppoſed to be the ſtandard of Elizabeth, there would be no great injury done: this would raiſe the valuation only 5 *per cent.* and the land tax in proportion.

There is no claſs of inhabitants in all England ſo much at their eaſe, and ſo free from taxes, as the claſs of farmers. By living in the country, and by conſuming the fruits of the earth without their ſuffering any alienation, they avoid the effect of many exciſes, which, by thoſe who live in corporations, are felt upon *many articles* of their conſumption, as well as on thoſe which are immediately loaded with theſe impoſitions. For this reaſon it will not, perhaps, appear unreaſonable, if the additional 5 *per cent.* on the land tax were thrown upon this claſs, and not upon the landlords.

With reſpect to leaſes, it may be obſerved, that we have gone upon the ſuppoſition that the pound ſterling in the year 1728, was worth 1718.7 grains of fine ſilver, and 113 grains of fine gold.

There would be no injuſtice done the leſſees of all the lands in the kingdom, were their rents to be fixed at the mean proportion of theſe values. We have obſerved how the pound ſterling has been gradually diminiſhing in its worth from that time by the gradual riſe of the ſilver. This mean proportion, therefore, will nearly anſwer to what the value of the pound ſterling was in 1743; ſuppoſing the riſe of the ſilver to have been uniform.

It may be farther alledged in favour of the landlords, that the gradual debaſement of the ſtandard has been more prejudicial to their intereſt in letting their lands, than to the farmers in diſpoſing of the fruits of them. Proprietors cannot ſo eaſily raiſe their rents upon new leaſes, as farmers can raiſe the prices of their grain, according to the debaſement of the value of the currency.

The pound ſterling, thus regulated at the mean proportion of its worth, as it ſtands at preſent, and as it ſtood in 1728, may be realized in 1678.6 grains of fine ſilver, and 115.76 grains fine gold; which is 2.4 *per cent.* above the value of the preſent currency. No injury, therefore, would be done to leſſees, and no unreaſonable gain would accrue to the landed intereſt, in appointing converſions of all land rents at $2\frac{1}{2}$ *per cent.* above the value of the preſent currency.

Without a thorough knowledge of every circumſtance relating to Great Britain, it is impoſſible to lay down any plan. It is ſufficient, here, briefly to point out the principles upon which it muſt be regulated.

The next intereſt to be conſidered is that of the nation's creditors. The right regulation of their concerns will have a conſiderable influence in eſtabliſhing public credit upon a ſolid baſis, by making it appear to all the world, that no political operation upon the money of Great Britain can in any reſpect either benefit or prejudice the intereſt of thoſe who lend their money upon the faith of the nation. The regulating alſo the intereſt of ſo great a body, will ſerve as a rule for all creditors who are in the ſame circumſtances, and will, upon other accounts, be productive of greater advantages to the nation in time coming.

In 1749, a new regulation was made with the public creditors, when the intereſt of the whole redeemable national debt was reduced to 3 *per cent.* This circumſtance infinitely facilitates the matter, with reſpect to this claſs, ſince, by this innovation of all former contracts, the whole national debt may be conſidered as contracted at or poſterior to the 25th of December 1749.

Were the ſtate, by any arbitrary operation upon money, (which every reformation muſt be,) to diminiſh the value of the pound ſterling in which the parliament at that time bound the nation to acquit thoſe capitals and the intereſt upon them, would not all Europe ſay, that the Britiſh parliament had defrauded their creditors? If therefore the operation propoſed to be performed ſhould have a contrary tendency, to wit, to augment the value of the pound ſterling with which the parliament at that time bound the nation to acquit thoſe capitals and intereſts, muſt not all Europe alſo agree, that the Britiſh parliament had defrauded the nation?

This convention with the ancient creditors of the ſtate, who, in conſequence of the debaſement of the ſtandard, might have juſtly claimed an indemnification for the loſs upon their capitals, lent at a time when the pound ſterling was at the value of the heavy ſilver, removes all cauſe of complaint from that quarter. There was in the year 1749, an innovation in all their contracts; and they are now to be conſidered as creditors only from the 25th of December of that year.

Let the value of the pound ſterling be inquired into during one year preceding and one poſterior to the tranſ-

action

action of the month of December 1749. The great ſums borrowed and paid back by the nation during that period will furniſh data ſufficient for that calculation. Let this value of the pound be ſpecified in troy grains of fine ſilver and fine gold bullion, without mentioning any denomination of money according to the exact proportion of the metals at that time. And let this pound be called the *pound of national credit*.

This firſt operation being determined, let it be enacted, that the pound ſterling, by which the ſtate is to borrow for the future, and that in which the creditors are to be paid, ſhall be the exact mean proportion between the quantities of gold and ſilver above ſpecified, according to the actual proportion of the metals at the time ſuch payments ſhall be made; or that the ſums ſhall be borrowed or acquitted, one half in gold and one half in ſilver, at the reſpective requiſitions of the creditors or of the ſtate, when borrowing. All debts contracted poſterior to 1749, may be made liable to converſions.

The conſequence of this regulation will be the inſenſible eſtabliſhment of a bank money. Nothing would be more difficult to eſtabliſh, by a poſitive revolution, than ſuch an invariable meaſure; and nothing will be found ſo eaſy as to let it eſtabliſh itſelf by its own advantages. This bank money will be liable to much fewer inconveniences than that of Amſterdam. There the perſons tranſacting muſt be upon the ſpot; here, the ſterling currency may, every quarter of a year, be adjuſted by the exchequer to this invariable ſtandard, for the benefit of all debtors and creditors, who incline to profit of the ſtability of this meaſure of value.

This ſcheme is liable to no inconvenienee from the variation of the metals, let them be ever ſo frequent, or hard to be determined; becauſe upon every occaſion where there is the ſmalleſt doubt as to the actual proportion, the option competent to creditors to be paid half in ſilver and half in gold will remove.

Such a regulation will alſo have this good effect, that it will give the nation more juſt ideas of the nature of money, and conſequently of the influence it ought to have upon prices.

If the value of the pound ſterling ſhall be found to have been by accident leſs in December 1749, than it is at preſent; or if at preſent the currency be found below what has commonly been ſince 1749, in juſtice to the creditors, and to prevent all complaints, the nation may grant them the mean proportion of the value of the pound ſterling from 1749 to 1760; or any other which may to parliament appear reaſonable.

This regulation muſt appear equitable in the eyes of all Europe; and the ſtrongeſt proof of it will be, that it will not produce the ſmalleſt effect prejudicial to the intereſt of the foreign creditors. The courſe of exchange with regard to them will ſtand preciſely as before.

A Dutch, French, or German creditor, will receive the ſame value for his intereſt in the Engliſh ſtocks as heretofore. This muſt ſilence all clamours at home, being the moſt convincing proof, that the new regulation of the coin will have made no alteration upon the real value of any man's property, let him be debtor or creditor.

The intereſt of every other denomination of creditors, whoſe contracts are of a freſh date, may be regulated upon the ſame principles. But where debts are of an old ſtanding, juſtice demands, that attention be had to the value of money at the time of contracting. Nothing but the ſtability of the Engliſh coin, when compared with that of other nations, can make ſuch a propoſal appear extraordinary. Nothing is better known in France than this ſtipulation added to obligations, *Argent au cours de ce jour;* that is to ſay, that the ſum ſhall be repaid in coin of the ſame intrinſic value with what has been lent. Why ſhould ſuch a clauſe be thought reaſonable for guarding people againſt arbitrary operations upon the numerary value of the coin, and not be found juſt upon every occaſion where the numerary value of it is found to be changed, let the cauſe be what it will?

The next intereſt we ſhall examine is that of trade. When men have attained the age of twenty one, they have no more occaſion for guardians. This may be applied to traders: they can party with their pen every inconvenience which may reſult to other people from the changes upon money, provided only the laws permit them to do themſelves juſtice with reſpect to their engagements. This claſs demands no more than a right to convert all reciprocal obligations into denominations of coin of the ſame intrinſic value with thoſe they have contracted in.

The next intereſt is that of buyers and ſellers; that is, of manufacturers with regard to conſumers, and of ſervants with reſpect to thoſe who hire their perſonal ſervice.

The intereſt of this claſs requires a moſt particular attention. They muſt, literally ſpeaking, be put to ſchool, and taught the firſt principles of their trade, which is buying and ſelling. They muſt learn to judge of price by the grains of ſilver and gold they receive: They are children of a mercantile mother, however warlike the father's diſpoſition may be. If it be the intereſt of the ſtate that their bodies be rendered robuſt and active, it is no leſs the intereſt of the ſtate that their minds be inſtructed in the firſt principle of the trade they exerciſe.

For this purpoſe, tables of converſion from the old ſtandard to the new muſt be made, and ordered to be put up in every market, in every ſhop. All duties, all exciſes, muſt be converted in the ſame manner. Uniformity muſt be made to appear every where. The ſmalleſt deviation from this will be a ſtumbling block to the multitude.

Not only the intereſt of the individuals of the claſs we are at preſent conſidering, demands the nation's care and attention in this particular; but the proſperity of trade, and the well-being of the nation, are alſo deeply intereſted in the execution.

The whole delicacy of the intricate combinations of commerce depends upon a juſt and equable vibration of prices, according as circumſtances demand it. The more therefore the induſtrious claſſes are inſtructed in the principles which influence prices, the more eaſily will the machine move. A workman then learns to ſink his price without regret, and can raiſe it without avidity. When principles ar enot underſtood, prices cannot gently fall, they

they muſt be pulled down; and merchants dare not ſuffer them to riſe, for fear of abuſe, even although the perfection of an infant manufacture ſhould require it.

The laſt intereſt is that of the bank of England, which naturally muſt regulate that of every other.

Had this great company followed the example of other banks, and eſtabliſhed a bank money of an invariable ſtandard, as the meaſure of all their debts and credits, they would not have been liable to any inconvenience upon a variation of the ſtandard.

The bank of England was projected about the year 1694, at a time when the current money of the nation was in the greateſt diſorder, and government in the greateſt diſtreſs, both for money and for credit. Commerce was then at a very low ebb; and the only, or at leaſt the moſt profitable trade of any, was jobbing in coin, and carrying backwards and forwards the precious metals from Holland to England. Merchants profited alſo greatly from the effects which the utter diſorder of the coin produced upon the price of merchandize.

At ſuch a juncture the reſolution was taken to make a new coinage; and upon the proſpect of this, a company was found, who, for an excluſive charter to hold a bank for 13 years, willingly lent the government upwards of a million ſterling at 8 *per cent.* (in light money we ſuppoſe) with a proſpect of being repaid both intereſt and capital in heavy. This was not all: part of the money lent was to be applied for the eſtabliſhment of the bank; and no leſs than 4000 pounds a year was allowed to the company, above the full intereſt, for defraying the charge of management.

Under ſuch circumſtances the introduction of bank-money was very ſuperfluous, and would have been very impolitic. That invention is calculated againſt the raiſing of the ſtandard; but here the bank profited of that riſe in its quality of creditor for the money lent, and took care not to commence debtor by circulating their paper, until the effect of the new regulation took place in 1695; that is, after the general recoinage of all the clippped ſilver.

From that time till now, the bank of England has been the baſis of the nation's credit, and with great reaſon has been conſtantly under the moſt intimate protection of every miniſter.

The value of the pound ſterling, as we have ſeen, has been declining ever ſince the year 1601, the ſtandard being fixed to ſilver during all that century, while the gold was conſtantly riſing. No ſooner had the proportion taken another turn, and ſilver begun to riſe, than the government of England threw the ſtandard virtually upon the gold, by regulating the value of the guineas at the exact proportion of the market. By theſe operations, however, the bank has conſtantly been a gainer (in its quality of debtor) upon all the paper in circulation; and therefore has loſt nothing by not having eſtabliſhed a bank-money.

The intereſt of this great company being eſtabliſhed upon the principles we have endeavoured to explain, it is very evident, that the government of England never will take any ſtep in the reformation of the coin which in its conſequences can prove hurtful to the bank. Such a ſtep would be contrary both to juſtice and to common ſenſe. To make a regulation which, by raiſing the ſtandard, will prove beneficial to the public creditors, to the prejudice of the bank (which we may call the public debtor) would be an operation upon public credit, like that of a perſon who is at great pains to ſupppit his houſe by props upon all ſides, and who at the ſame time blows up the foundation of it with gun-powder.

We may therefore conclude, that with regard to the bank of England, as well as every other private banker, the notes which are conſtantly payable upon demand muſt be made liable to a converſion at the actual value of the pound ſterling at the time of the new regulation.

That the bank will gain by this, is very certain; but the circulation of their notes is ſo ſwift that it would be abſurd to allow to the then poſſeſſors of them that indemnification which naturally ſhould be ſhared by all thoſe through whoſe hands they have paſſed, in proportion to the debaſement of the ſtandard during the time of their reſpective poſſeſſion.

Beſides theſe conſiderations, which are in common to all ſtates, the government of Great Britain has one peculiar to itſelf. The intereſt of the bank, and that of the creditors, are diametrically oppoſite: every thing which raiſes the ſtandard, hurts the bank; every thing which can ſink it, hurts the creditors: and upon the right management of the one and the other, depends the ſolidity of public credit. For theſe reaſons, without the moſt certain proſpect of conducting a reſtitution of the ſtandard to the general advantage as well as approbation of the nation, no miniſter will probably ever undertake ſo dangerous an operation.

We ſhall now propoſe an expedient which may remove at leaſt ſome of the inconveniences which would reſult from ſo extenſive an undertaking as that of regulating the reſpective intereſts in Great Britain by a poſitive law, upon a change in the value of their money of accompt.

Suppoſe then, that, before any change is made in the coin, government ſhould enter into a tranſaction with the public creditors, and aſcertain a permanent value for the pound ſterling for the future, ſpecified in a determined proportion of the fine metals in common bullion, without any regard to money of accompt, or to any coin whatever.

This preliminary ſtep being taken, let the intended alteration of the ſtandard be proclaimed a certain time before it is to commence. Let the nature of the change be clearly explained, and let all ſuch as are engaged in contracts which are diſſolvable at will upon the preſtations ſtipulated, be acquitted between the parties, or innovated as they ſhall think proper, with certification, that, poſterior to a certain day, the ſtipulations formerly entered into ſhall be binding according to the denominations of the money of accompt in the new ſtandard.

As to permanent contracts, which cannot at once be fulfilled and diſſolved, ſuch as leaſes, the parliament may either preſcribe the methods and terms of converſion; or a liberty may be given to the parties to annul the contract, upon the debtor's refuſing to perform his agreement according to the new ſtandard. Contracts, on the other hand, might remain ſtable, with reſpect to credi-

tors who would be ſatisfied with payments made on the footing of the old ſtandard. If the riſe intended ſhould not be very conſiderable, no great injuſtice can follow ſuch a regulation.

Annuities are now thoroughly underſtood, and the value of them is brought to ſo nice a calculation, that nothing will be eaſier than to regulate theſe upon the footing of the value paid for them, or of the ſubject affected by them. If by the regulation land-rents are made to riſe in denomination, the annuities charged upon them, ought to riſe in proportion; if in intrinſic value, the annuity ſhould remain as it was.

Regulations which the principles of this inquiry point out as expedient to be made by a new ſtatute for regulating the Britiſh coin.

Let us now examine what regulations it may be proper to make by a new ſtatute concerning the coin of Great Britain, in order to preſerve always the ſame exact value of the pound ſterling realized in gold and in ſilver, in ſpite of all the incapacities inherent in the metals to perform the functions of an invariable ſcale or meaſure of value.

1. The firſt point is to determine the exact number of grains of fine gold and fine ſilver which are to compoſe it, according to the then proportion of the metals in the London market.

2. To determine the proportion of theſe metals with the pound troy, and in regard that the ſtandard of gold and ſilver is different, let the mint price of both metals be regulated according to the pound troy fine.

3. To fix the mint price within certain limits: that is to ſay, to leave to the King and Council, by proclamation, to carry the mint price of bullion up to the value of the coin, as is the preſent regulation, or to ſink it to *per cent.* below that price, according as government ſhall incline to impoſe a duty upon coinage.

4. To order, that ſilver and gold coin ſhall be ſtruck of ſuch denominations as the King ſhall think fit to appoint; in which the proportion of the metals above determined ſhall be conſtantly obſerved through every denomination of the coin, until neceſſity ſhall make a new general coinage unavoidable.

5. To have the number of grains of the fine metal in every piece marked upon the exergue, or upon the legend of the coin, in place of ſome initial letters of titles, which not one perſon in a thouſand can decypher; and to make the coin of as compact a form as poſſible, diminiſhing the ſurface of it as much as is conſiſtent with beauty.

6 That it ſhall be lawful for all contracting parties to ſtipulate their payments either in gold or ſilver coin, or to leave the option of the ſpecies to one of the parties.

7. That where no particular ſtipulation is made, creditors ſhall have power to demand payment, half in one ſpecies, half in the other; and when the ſum cannot fall equally into gold and ſilver coins, the fractions to be paid in ſilver.

8. That in buying and ſelling, when no particular ſpecies has been ſtipulated, and when no act in writing has intervened, the option of the ſpecies ſhall be competent to the buyer.

9. That all ſums paid or received by the King's receivers, or by bankers, ſhall be delivered by weight, if demanded.

10 That all money which ſhall be found under the legal weight, from whatever cauſe it may proceed, may be rejected in every payment whatſoever; or if offered in payment of a debt above a certain ſum, may be taken according to its weight, at the then mint price, in the option of the creditor.

11. That no penalty ſhall be incurred by thoſe who melt down or export the nation's coin; but that waſhing, clipping, or diminiſhing the weight of any part of it ſhall be deemed felony, as much as any other theft, if the perſon ſo degrading the coin ſhall afterwards make it circulate for lawful money.

To prevent the inconveniences proceeding from the variation in the proportion between the metals, it may be provided,

12. That upon every variation of proportion in the market price of the metals, the price of both ſhall be changed, according to the following rule.

Let the price of the pound troy fine gold in the coin be called G.

Let the price of ditto in the ſilver be called S.

Let the new proportion between the market price of the metals be called P.

Then ſtate this formula:

$\frac{G}{2P}+\frac{S}{2}=$ to a pound troy fine ſilver, in ſterling currency.

$\frac{S}{2}+P+\frac{G}{2}=$ to a pound troy fine gold, in ſterling currency.

This will be a rule for the mint, to keep the price of the metals conſtantly at par with the price of the market; and coinage may be impoſed, as has been deſcribed, by fixing the mint price of them at a certain rate below the value of the fine metals in the coin.

13. As long as the variation of the market price of the metals ſhall not carry the price of the riſing metal ſo high as the advanced price of the coin above the bullion, no alteration need be made on the denomination of either ſpecies.

14. So ſoon as the variation of the market price of the metals ſhall give a value to the riſing ſpecies, above the difference between the coin and the bullion; then the king ſhall alter the denominations of all the coin, ſilver and gold, adding to the coins of the riſing metal exactly what is taken from thoſe of the other. An example will make this plain.

Let us ſuppoſe that the coinage has been made according to the proportion of 14.5 to 1; that 20 ſhillings, or 4 crown-pieces, ſhall contain, in fine ſilver, 14.5 times as many grains as the guinea, or the gold pound, ſhall contain grains of fine gold. Let the new proportion of the metals be ſuppoſed to be 14 to 1. In that caſe, the 20 ſhillings, or the 4 crowns, will contain $\frac{1}{28}$ more value than the guinea. Now ſince there is no queſtion of making a new general coinage upon every variation, in order to adjuſt the proportion of the metals in the weight of

of the coins, that proportion muſt be adjuſted by changing their reſpective denominations according to this formula.

Let the 20 ſhillings, or 4 crowns, in coin, be called S. Let the guinea be callen G. Let the difference between the old proportion and the new, which is $\frac{1}{29}$, be called P. Then ſay,

$$S - \frac{P}{2} = \text{a pound ſterling, and } G + \frac{P}{2} = \text{a pound ſterling.}$$

By this it appears that all the ſilver coin muſt be raiſed in its denomination $\frac{1}{58}$, and all the gold coin muſt be lowered in its denomination $\frac{1}{58}$; yet ſtill S+G will be equal to two pounds ſterling, as before, whether they be conſidered according to the old, or according to the new denominations.

But it may be obſerved, that the impoſition of coinage rendering the value of the coin greater than the value of the bullion, that circumſtance gives a certain latitude in fixing the new denominations of the coin, ſo as to avoid minute fractions. For, providing the deviation from the exact proportion ſhall fall within the advanced price of the coin, no advantage can be taken by melting down one ſpecies preferably to another; ſince, in either caſe, the loſs incurred by melting the coin muſt be greater than the profit made upon ſelling the bullion. The mint price of the metals, however, may be fixed exactly, that is, within the value of a farthing upon a pound of fine ſilver or gold. This is eaſily reckoned at the mint; although upon every piece in common circulation the fractions of farthings would be inconvenient

15. That notwithſtanding of the temporary variations made upon the denomination of the gold and ſilver coins, all contracts formally entered into, and all ſtipulations in pounds ſhillings and pence, may continue to be acquitted according to the old denominations of the coins, paying one half in gold, and one half in ſilver: unleſs in the caſe where a particular ſpecies has been ſtipulated; in which caſe, the ſums muſt be paid according to the new regulation made upon the denomination of that ſpecies to the end that neither profit or loſs may reſult to any of the parties.

16. That notwithſtanding the alterations on the mint price of the metals, and in the denomination of the coins, no change ſhall be made upon the weight of the particular pieces of the latter, except in the caſe of a general recoinage of one denomination at leaſt: that is to ſay, the mint muſt not coin new guineas, crowns, *&c.* of a different weight from thoſe already in currency, although by ſo doing the fractions might be avoided. This would occaſion confuſion, and the remedy would ceaſe to be of any uſe upon a new change in the proportion of the metals. But it may be found convenient, for removing the ſmall fractions in ſhillings and ſixpences, to recoin ſuch denominations all together, and to put them to their integer numbers, of twelve and of ſix pence, without changing in any reſpect their proportion of value to all other denominations of the coin: this will be no great expence, when the bulk of the ſilver coin is put into 5 ſhilling pieces.

By this method of changing the denominations of the coin, there never can reſult any alteration in the value of the pound ſterling: and although fractions of value may now and then be introduced, in order to prevent the abuſes to which the coin would otherwiſe be expoſed by the artifice of thoſe who melt it down, yet ſtill the inconvenience of ſuch fractions may be avoided in paying, according to the old denominations, in both ſpecies, by equal parts. This will alſo prove demonſtratively, that no change is thereby made in the true value of the national unit of money.

17. That it be ordered, that ſhillings and ſixpences ſhall only be current for twenty years, and all other coins, both gold and ſilver, for forty years, or more. For aſcertaining which term, there may be marked, upon the exergue of the coin, the laſt year of their currency, in place of the date of their fabrication. This term elapſed, or the date effaced, that they ſhall have no more currency whatſoever; and when offered in payment, may be received as bullion at the actual price of the mint, or refuſed at the option of the creditor.

18. That no foreign coin ſhall have any *legal* currency, except as bullion at the mint price.

By theſe or the like regulations may be prevented, *1mo,* The melting or exporting of the coin in general. *2do,* The melting or exporting one ſpecies, in order to ſell it as bullion, at an advanced price. *3tio,* The profit in acquitting obligations preferably in one ſpecies to another. *4to,* The degradation of the ſtandard, by the wearing of the coin, or by a change in the proportion between the metals. *5to,* The circulation of the coin below the legal weight. *9to,* The profit that other nations reap by paying their debts more cheaply to Great Britain than Great Britain can pay hers to them.

And the great advantage of it is, that it is an uniform plan, and may ſerve as a perpetual regulation, compatible with all kinds of denominations of coins, variations in the proportion of the metals, and with the impoſition of a duty upon coinage; or with the preſerving it free; and further, that it may in time be adopted by other nations, who will find the advantage of having their money of accompt preſerved perpetually at the ſame value, with reſpect to the denominotions of all foreign money of accomp eſtabliſhed on the ſame principles.

A TABLE OF COINS,

Shewing the Quantity of Fine Metal contained in them.

The number of grains of fine metal in every coin is ſought for in the regulations of the mint of the country where it is coined, and is expreſſed in the grains in uſe in that mint. From that weight it is converted into thoſe of other countries, according to the following proportions:

3840 Troy grains, 4676.35 Paris grains, 5192.8 Holland aces or grains, and 4649.06 Colonia grains, are ſuppoſed to be equal weights; and the coins in the Table are converted according to thoſe proportions.

	Table of Coins, reduced to Grains of fine Metal, according to the Troy, Paris, Colonia and Holland weights.	Gold Coins.				Silver Coins.			
		Troy.	Paris.	Colonia.	Holland.	Troy.	Paris.	Colonia	Holland.
English Coins.	1 A Guinea by ſtatute — — — — —	118.651	144 46	143.65	160.45				
	2 A Crown by ſtatute — — — — —	— —	— —	— —	— —	429 68	523.2	520.2	581.
	3 A Shilling by ſtatute — — — — —	— —	— —	— —	— —	85.935	104.65	104.	116.2
	4 A Silver Pound ſterling by ſtatute 1601 — —	— —	— —	— —	— —	1718.7	2093.	2080.8	2324.1
	5 A Gold Pound ſterling by ſtatute 1728 — — —	113.	137.61	126.8	152.8				
	6 A Silver Pound ſterling in currency = $\frac{20}{62}$ lib. Troy —	— —	— —	— —	— —	1639.38	1996.4	1984.7	2216.
	7 A Silver Pound ſterl. at the proportion of gold to ſilver as 1 to $14\frac{1}{2}$	113.	137.61	136.8	152.8	1638.5	1995.3	1983.7	2215.7
	8 A Gold Pound ſterling at the ſame proportion of 1 to $14\frac{1}{2}$	118.4	144.18	143.34	160.11	1718.7	2093.	2080.8	2324.1
	9 A Pound ſterling at the mean proportion in gold and in ſilver	115.769	140.98	140 16	156.55	1678.6	2044 2	2032.2	2269.9
	10 A Shilling current = $\frac{1}{62}$ of a pound Troy — —	— —	— —	— —	— —	81.961	99 8	99.	110.82
	11 A Guinea in ſilver, or 21 Shillings ſtandard weight —	— —	— —	— —	— —	1804.6	2197 6	2184.8	2440.3
	12 A Guinea at the proportion of 1 to $14\frac{1}{2}$, worth in ſilver	— —	— —	— —	— —	1720.4	2095.1	2082.8	2326.4
	13 A Pound Troy, or 12 ounces Engliſh weight — —	5760.	7019 2	6973 5	7789.2				
French Coins.	1 A Louis d'or — — — — — —	113.27	137.94	137 13	153.17				
	2 A Crown of ſix livres — — — —	— —	— —	— —	— —	409.94	499.22	496.3	554.3
	3 A Crown of three ditto — — — — —	— —	— —	— —	— —	204.97	249.61	248.15	277.1
	4 A Livre — — — — — —	— —	— —	— —	— —	68.34	83.23	82.74	92.42
	5 A Louis d'or, or 24 livres in ſilver — — —	— —	— —	— —	— —	1639.7	1996.9	1985.2	2217.4
	6 A Marc of Paris weight, fine gold or ſilver — —	3783.87	4608.	4581.1	5116.9	3783.87	4608.	4581.1	5116.9
	7 A Marc of gold coin effective weight, in fine — —	3398.3	4138 5	4114.3	4593.4				
	8 A Marc of ſilver coin effective weight, in fine — —	— —	— —	— —	— —	3402.3	4143.4	4119.2	4600.9
German Coins.	1 A Carolin legal weight — — — —	115.45	140.6	139.78	156.12				
	2 A Ducat of the Empire ditto — — — — —	52.8	64.37	64.	71.48				
	3 A Florin of Convention — — — —	— —	— —	— —	— —	179.73	218.87	217.6	243.
	4 A Dollar of Convention — — — — — —	— —	— —	— —	— —	269.59	328.31	326.4	364.5
	5 A Dollar of Exchange, the Carolin = 9 flor. 42 kreutzers	17.85	21.74	21.615	24.14				
	6 A Florin current = $\frac{1}{11}$ of a Carolin — —	10.54	12.84	12.77	14.26				
	7 A Carolin in ſilver, at the proportion of 1 to $14\frac{1}{2}$ —	— —	— —	— —	— —	1674.	2038.6	2026.8	2263.8
Dutch Coins.	1 A Dutch Ducat — — — — —	51.76	63.	62.67	70.				
	2 A Florin in ſilver — — — — — —	— —	— —	— —	— —	148.	180.3	179.2	200.21

MONK, a perſon who wholly dedicates himſelf to the ſervice of religion, in ſome monaſtery, under the direction of ſome particular ſtatutes and rules.

The moſt probable account of the original of the monks is, that in the Decian perſecution, in the middle of the IIId century, many perſons in Egypt, to avoid the fury of the ſtorm, fled to the neighbouring deſarts and mountains, where they not only found a ſafe retreat, but alſo more time and liberty to exerciſe themſelves in acts of piety and divine contemplations; which ſort of life became ſo agreeable, that when the perſecution was over, they refuſed to return to their habitations again, chuſing rather to continue in thoſe cottages and cells, which they had made for themſelves in the wilderneſs. From that time to the reign of Conſtantine, monachiſm was confined to the hermits or anachorets, who lived in private cells in the wilderneſs; but when Pachomius had erected monaſteries, other countries preſently followed the example.

MONKEY, in zoology. See SIMIA.

MONMOUTH, the capital of Monmouth-ſhire, ſituated on the river Wye, twenty-five miles north of Briſtol.

MONOCHORD, a muſical inſtrument, compoſed of one ſtring, uſed to try the variety and proportion of ſounds.

MONOCULUS, in zoology, a genus of the order of aptera. The feet are fitted for ſwimming; the body is covered with a cruſtaceous ſkin; and the eyes are very near each other. There are nine ſpecies.

MONODON, in ichthyology, a genus of fiſhes belonging to the order of bete. It has a long wreathed tooth in the upper jaw, which perforates the upper-lip, and has the appearance of a horn; from this circumſtance it has got the name of the unicorn-fiſh. This fiſh is of the whale kind, and often grows to 25 feet in length, though the general ſize is from 16 to 20.

MONODY, in ancient poetry, a mournful kind of ſong, ſung by a perſon all alone, to give vent to his grief.

MONOECIA, in botany. See BOTANY, p. 635.

MONOGAMY, the ſtate or condition of thoſe who have only been once married, and are reſtrained to a ſingle wife.

MONOGRAM, a character or cypher, compoſed of one, two, or more letters, interwoven; being a kind of abbreviation of a name, anciently uſed as a ſeal, badge, arms, *&c*.

MONOLOGUE, in poetry, a dramatic ſcene, in which a perſon appears alone on the ſtage, and ſpeaks to himſelf.

MONOMOTOPA, a country of Africa, bounded by Monemugi on the north, and by Cafraria on the eaſt, ſouth, and weſt.

MONOPETALOUS, in botany, a term applied to flowers that have only one petal, or flower-leaf.

MONOPOLI, a town in the kingdom of Naples, ſituated on the gulph of Venice: E long. 18°, and N. lat. 4 .° 5′

MONOPOLY, one or more perſons making themſelves the ſole maſters of the whole of a commodity, manufacture, and the like, in order to make private advantage of it, by ſelling it again at a very advanced price.

MONOPYRENEOUS, in botany, ſuch fruit as contains only one ſeed, or kernel.

MONOSTICH, an epigram that conſiſts of only one ſingle verſe.

MONOSYLLABLE, in grammar, a word that conſiſts of only one ſyllable, and is compoſed of either one or more letters pronounced at the ſame time.

MONOTONY, an uniformity of ſound, or a fault in pronunciation, when a long ſeries of words are delivered in one unvaried tone.

MONOTROPA, in botany, a genus of the decandria monogynia claſs. It has no calix; the petals are ten; and it has five capſules. There are two ſpecies, one of which, *viz.* the hypopithys, or bird's neſt ſmelling like the roots of the primroſe, is a native of Britain.

MONS, the capital of the province of Hainalt, in the Auſtrian Netherlands: ſituated twenty-ſix miles ſouth-weſt of Bruſſels: eaſt long. 3° 33′, and ſouth lat. 50° 34′.

MONSIEUR, a title of civility uſed by the French, in ſpeaking to, or of their equals, or thoſe that are but a little below them, ſynonimous with SIR in Engliſh.

MONSOON, in phyſiology, a ſpecies of trade-wind, in the Eaſt-Indies, which for ſix months blows conſtantly the ſame way, and the contrary way the other ſix months. See PNEUMATICS, *Of Winds*.

MONSTER, in general, denotes any production that deviates from the ſpecies to which it belongs, whether with reſpect to the number or diſpoſition of its parts; in which ſenſe, a man with ſix fingers on each hand, or ſix toes on each foot, is a monſter. But the term monſter ſeems to be chiefly applied to ſuch productions as deviate very much from the ordinary courſe of nature.

MONTE SANCTO, or MOUNT-ATHOS, a mountain of European Turky, in the province of Macedon: E. long. 23°, and N. lat. 4[illegible]° 12′.

It is called Monte Sancto, or Holy Mountain, from twenty two monaſteries ſituated upon it, in which are four thouſand monks or friars, who never ſuffer a woman to come within ſight of their convent.

MONTFERRAT, a duchy in Italy, bounded by the lordſhip of Verceil on the north, by the Alexandrin on the eaſt, by the territory of Genoa on the ſouth, and by the county of Aſti on the weſt.

MONTFORT, the capital of the county of Montfort, in the circle of Swabia, in Germany: E. long. 9° 40′, and N. lat. 47° 15′.

MONTGOMERY, the capital of Montgomeryſhire, in Wales, ſituated on the river Severn, twenty miles ſouth-weſt of Shrewſbury.

MONTH, the twelfth part of a year. See ASTRONOMY.

MONTIA, in botany, a genus of the triandria trigynia claſs. The calix conſiſts of one leaf, and the corolla of one irregular petal; and the capſule has one cell and three valves. There is but one ſpecies, *viz.* the fentana, or water chickweed, a native of Britain.

 MONTIFRINGILLA,

MONTIFRINGILLA, in zoology. See FRINGILLA.

MONTPELIER, a city of France, in the province of Languedoc and county of Nifmes, fituated on the little river Lez, fifty miles north-eaft of Narbonne, and forty-five miles fouth-weft of Avignon; a place famous for its delightful fituation, and its healthy ferene air.

MONTREAL, a city of Sicily, in the province of Mazara, fituated near the fea, five miles eaft of Palermo.

MONTREAL is alfo a town of Canada, in North America, fituated on the river of St Laurence, one hundred miles fouth of Quebec.

MONTROSE, a town of North Britain, in the fhire of Angus, fituated at the mouth of the river Efk, on the German ocean, forty-fix miles north-eaft of Edinburgh.

Steel fpaws are very numerous in the country about Montrofe; befides thefe, there is a well near this town whofe water is of a whitifh colour, foft tafte, and faintly difcovering a mineral quality, and is of a different nature from the fteel one. It is univerfally diuretic; and has been found ufeful in ftranguries, ftoppages of urine, fcorbutic diforders, flatulencies, &c.

MONTSERAT, a mountain of Spain, in the province of Catalonia, twenty-one miles north-weft of Barcelona, where there is a monaftery and chapel dedicated to the Virgin Mary, to which there is a great refort of pilgrims.

MONTSERAT is alfo one of the fmalleft of the Caribbee iflands; it is fituated about thirty miles fouth-weft of Antigua.

MONUMENT, in architecture, a building deftined to preferve the memory, &c. of the perfon who raifed it, or for whom it was raifed; fuch are a triumphal arch, a maufoleum, a pyramid, &c.

MOOD, or MODE. See LOGIC and METAPHYSICS.

MOOD, or MODE, in grammar, the different manner of conjugating verbs. See GRAMMAR.

MOON, in aftronomy. See ASTRONOMY, p. 440.

MOON-WORT, in botany. See LUNARIA.

MOOR, in country affairs, denotes an unlimited tract of land, ufually over-run with heath.

MOOR-BUZZARD. See FALCO.

MOOR-COCK, or GOR-COCK. See TETRAO.

MOOR-STONE, a valuable ftone, much ufed in the coarfer works of the prefent builders; being truly a white granite, of a marbly texture.

MOORING, or MOARING, in the fea language, is the laying out the anchors of a fhip in a place where fhe can ride fecure.

MORAL, fomething belonging to manners, or the conduct of life. See——

MORAL PHILOSOPHY, OR MORALS.

MORAL PHILOSOPHY is "The fcience of MANNERS or DUTY; which it traces from man's nature and condition, and fhews to terminate in his happinefs." In other words, it is "The knowledge of our DUTY and FELICITY;" or, "The art of being VIRTUOUS and HAPPY."

It is denominated an art, as it contains a fyftem of rules for becoming virtuous and happy. Whoever practifes thefe rules, attains an habitual power or facility of becoming virtuous and happy. It is likewife called a fcience, as it deduces thofe rules from the principles and connexions of our nature, and proves that the obfervance of them is productive of our happinefs.

It is an art, and a fcience, of the higheft dignity, importance, and ufe. Its object is man's duty, or his conduct in the feveral moral capacities and connections which he fuftains. Its office is to direct that conduct; to fhew whence our obligations arife, and where they terminate. Its ufe, or end, is the attainment of happinefs; and the means it employs are rules for the right conduct of our moral powers.

Moral Philofophy has this in common with Natural Philofophy, that it appeals to nature or fact; depends on obfervation; and builds its reafonings on plain uncontroverted experiments, or upon the fulleft induction of particulars of which the fubject will admit. We muft obferve, in both thefe fciences, how nature is affected, and what her conduct is in fuch and fuch circumftances. Or, in other words, we muft collect the appearances of nature in any given inftance; trace thefe to fome general principles, or laws of operation; and then apply thefe principles or laws to the explaining of other phænomena.

Therefore Moral Philofophy inquires, not how man might have been, but how he is, conftituted: not into what principles or difpofitions his actions may be artfully refolved; but from what principles and difpofitions they actually flow: not what he may, by education, habit, or foreign influence, come to be, or do; but what, by his nature, or original conftituent principles, he is formed to be and do. We difcover the office, ufe, or deftination of any work, whether natural or artificial, by obferving its ftructure, the parts of which it confifts, their connection or joint action. It is thus we underftand the office and ufe of a watch, a plant, an eye, or hand. It is the fame with a living creature, of the rational, or brute kind. Therefore, to determine the office, duty, or deftination of man; or, in other words, what his bufinefs is, or what conduct he is obliged to purfue; we muft infpect his conftitution, take every part to pieces, examine their mutual relations one to the other, and the common effort or tendency of the whole.

Of Man and his connections.

MAN is born a weak, helplefs, delicate creature; unprovided with food, cloathing, and whatever elfe is neceffary for fubfiftence, or defence. And yet, expofed as the

the infant is to numberlefs wants and dangers, he is utterly incapable of fupplying the former, or fecuring himfelf againft the latter. But, though thus feeble and expofed, he finds immediate and fure refources in the affection and care of his parents, who refufe no labours, and forego no dangers, to nurfe and rear up the tender babe. By thefe powerful inftincts, as by fome mighty chain, does nature link the parent to the child, and form the ftrongeft moral connection on his part, before the child has the leaft apprehenfion of it. Hunger and thirft, with all the fenfations that accompany or are connected with them, explain themfelves by a language ftrongly expreffive, and irrefiftibly moving. As the feveral fenfes bring in notices and informations of furrounding objects, we may perceive in the young fpectator early figns of a growing wonder and admiration. Bright objects and ftriking founds are beheld and heard with a fort of commotion and furprife. But without refting on any, he eagerly paffes on from object to object, ftill pleafed with whatever is moft new. Thus the love of novelty is formed, and the paffion of wonder kept awake. By degrees he comes acquainted with the moft familiar objects, his parents, his brethren, and thofe of the family who are moft converfant with him. He contracts a fondnefs for them; is uneafy when they are gone, and charmed to fee them again. Thefe feelings become the foundation of a moral attachment on his fide; and by this reciprocal fympathy he forms the domeftic alliance with his parents, brethren, and other members of the family. Hence he becomes interefted in their concerns; and feels joy or grief, hope or fear, on their account, as well as his own. As his affections now point beyond himfelf to others, he is denominated a good or ill creature, as he ftands well or ill affected to them. Thefe then are the firft links of the moral chain, the early rudiments or outlines of his character, his firft rude effays towards agency, freedom, manhood.

When he begins to make excurfions from the nurfery, and extend his acquaintance abroad, he forms a little circle of companions, engages with them in play or in queft of adventures, and leads or is led by them as his genius is more or lefs afpiring. Though this is properly the feafon in which appetite and paffion have the afcendant, yet his imagination and intellectual powers open apace: and as the various images of things pafs before the mental eye, he forms a variety of taftes; relifhes fome things and diflikes others, as his parents, companions, and a thoufand other circumftances, lead him to combine agreeable or difagreeable fets of ideas, or reprefent to him objects in alluring or odious lights.

As his views are enlarged, his active and focial powers expand themfelves in proportion; the love of action, of imitation, and of praife, emulation, curiofity, docility, a paffion for command, and fondnefs of change. His paffions are quick, variable, and pliant to every impreffion; his attachments and difgufts quickly fucceed each other. He compares things, diftinguifhes actions, judges of characters, and loves or hates them as they appear well or ill affected to himfelf or to thofe he holds dear. Mean while, he foon grows fenfible of the confequences of his own actions, as they attract applaufe, or bring contempt; he triumphs in the former, and is afhamed of the latter, wants to hide them, and blufhes when they are difcovered. By means of thefe powers, he becomes a fit fubject of culture, the moral tie is drawn clofer, he feels that he is accountable for his conduct to others as well as to himfelf, and thus is gradually ripening for fociety and action.

As man advances from childhood to youth, his paffions as well as perceptions take a more extenfive range. New fenfes of pleafure invite him to new purfuits; he grows fenfible to the attractions of beauty, feels a peculiar fympathy with the fex, and forms a more tender kind of attachment than he has yet experienced. This becomes the cement of a new moral relation, and gives a fofter turn to his paffions and behaviour. In this turbulent period he enters more deeply into a relifh of friendfhip, company, exercifes, and diverfions; the love of truth, of imitation and of defign, grows upon him; and as his connections fpread among his neighbours, fellow citizens, and countrymen, his thirft of praife, emulation, and focial affections grow more intenfe and active. Mean while it is impoffible for him to have lived thus long without having become fenfible of thofe more augult fignatures of order, wifdom, and goodnefs, which are ftamped on the vifible creation; and of thofe ftrong fuggeftions within himfelf of a parent mind, the fource of all intelligence and beauty, and the object as well as fource of that activity and thofe afpirations which fometimes rouze his inmoft frame and carry him out of himfelf to an all-mighty and all governing Power: Hence arife thofe fentiments of reverence, and thofe affections of gratitude, refignation, and love, which link the foul with the Author of nature, and form that moft fublime and godlike of all connections.

Man having now reached his prime, either new paffions fucceed, or the old fet are wound up to an higher pitch. For, growing more fenfible of his connection with the public, and that particular community to which he more immediately belongs; and taking withal a larger profpect of human life, and its various wants and enjoyments; he forms more intimate friendfhips, grafps at power, courts honour, lays down cooler plans of intereft, and becomes more attentive to the concerns of fociety; he enters into family-connections, and indulges thofe charities which arife from thence. The reigning paffions of this period powerfully prompt him to provide for the decays of life; and in it compaffion and gratitude exert their influence in urging the man, now in full vigour, to requite the affection and care of his parents, by fupplying their wants and alleviating their infirmities.

At length human life verges downwards; and old age creeps on apace, with its anxiety, love of eafe, intereftednefs, fearfulnefs, forefight, and love of offspring. The experience of the aged is formed to direct, and their coolnefs to temper, the heat of youth: the former teaches them to look back on paft follies; and the latter to look forward into the confequences of things, and provide againft the worft. Thus every age has its peculiar genius and fet of paffions, correfponding to that period, and moft conducive to the profperity of the reft. And thus are the

the wants of one period supplied by the capacities of another, and the weaknesses of one age tally to the passions of another.

Besides these, there are other passions and affections of a less ambulatory nature; not peculiar to one period, but belonging to every age, and acting more or less in every breast throughout life: such are, self-love, benevolence, love of life, honour, shame, hope, fear, desire, aversion, joy, sorrow, anger, and the like. The two first are affections of a cooler strain; one pointing to the good of the individual, the other to that of the species: joy, and sorrow, hope and fear, seem to be only modifications, or different exertions of the same original affections of love and hatred, desire and aversion, arising from the different circumstances or position of the object desired or abhorred, as it is present or absent. From these likewise arise other secondary, or occasional passions, which depend, as to their existence and several degrees, upon the original affections being gratified or disappointed; as, anger, complacence, confidence, jealousy, love, hatred, dejection, exultation, contentment, disgust, which do not form leading passions, but rather hold of them.

By these simple, but powerful springs, whether periodical or fixed, the life of man, weak and indigent as he is, is preserved and secured; and the creature is prompted to a constant round of action, even to supply his own numerous and ever-returning wants, and to guard against the various dangers and evils to which he is obnoxious. By these links, men are connected with each other, formed into families, drawn into particular communities, and all united, as by a common league, into one system or body, whose members feel and sympathize one with another. By this admirable adjustment of the constitution of man to his state, and the gradual evolution of his powers, order is maintained, society upheld, and human life filled with that variety of passion and action, which at once enliven and diversify it.

This is a short sketch of the principal movements of the human mind. Yet these movements are not the whole of man; they impel to action, but do not direct it; they need a regulator to guide their motions, to measure and apply their forces. And accordingly they have one that naturally superintends and directs their action. We are conscious of a principle within us, which examines, compares, and weighs things; notes the differences, observes the forces, and forsees the consequences of affections and actions. By this power we look back on past times, and forward into futurity, gather experiences, estimate the real and comparative value of objects, lay out schemes, contrive means to execute them, and settle the whole order and œconomy of life. This power we commonly distinguish by the name of reason, or reflection; the business of which is, not to suggest any original notices or sensations, but to canvass, range, and make deductions from them.

We are intimately conscious of another principle within us, which approves of certain sentiments, passions, and actions, and disapproves of their contraries. In consequence of the decisions of this inward judge, we denominate some actions and principles of conduct *right*, *honest*, *good;* and others *wrong*, *dishonest*, *ill*. The former excite our esteem, moral complacence, and affection, immediately and originally of themselves, without regard to their consequences, and whether they affect our interest or not. The latter do as naturally and necessarily call forth our contempt, scorn, and aversion. That power, by which we perceive this difference in affections and actions, and feel a consequent relish or dislike, is commonly called conscience, or the moral sense. Whether such a power belongs to human nature or not, must be referred to every one's experience of what passes within himself.

These two powers of reason and conscience, are evidently principles different in nature and kind from the passions and affections. For the passions are mere force or power, blind impulses, acting violently and without choice, and ultimately tending each to their respective objects, without regard to the interest of the others, or of the whole system: Whereas the directing and judging powers distinguish and ascertain the different forces, mutual proportions, and relations, which the passions bear to each other and to the whole; recognize their several degrees of merit; and judge of the whole temper and conduct, as they respect either the individual or the species; and are capable of directing or restraining the blind impulses of passion in a due consistency one with the other, and a regular subordination to the whole system.

This is some account of the constituent principles of our nature, which, according to their different mixtures, degrees, and proportions, mould our character, and sway our conduct in life. In reviewing that large train of affections which fill up the different stages of human life, we perceive this obvious distinction among them; that some of them respect the good of the individual, and others carry us beyond ourselves to the good of the species, or kind. The former have therefore been called private, and the latter public affections. Of the first sort are love of life, of pleasure, of power, and the like, Of the last are compassion, gratitude, friendship, natural affection, and the like. Of the private passions, some respect merely the security and defence of the creature; such as resentment, and fear: whereas others aim at some positive advantage or good; as wealth, ease, fame. The former sort therefore, because of this difference of objects, may be termed defensive passions. These answer to our dangers, and prompt us to avoid them if we can, or boldly to encounter them when we cannot.

The other class of private passions, which pursue private positive good, may be called appetitive. However, we shall still retain the name of private, in contradistinction to the defensive passions. Man has a great variety of wants to supply, and is capable of many enjoyments, according to the several periods of his life, and the different situations in which he is placed. To these, therefore, a suitable train of private passions correspond, which engage him in the pursuit of whatever is necessary for his subsistence or welfare.

Our public or social affections are adapted to the several social connections and relations which we bear to others, by making us sensible of their dangers, and interesting us in their wants, and so prompting us to secure them against one, and supply the other.

This is the first step then to discover the duty and destination

ftitution of man, the having analyzed the principles of which he is compofed. It is neceffary, in the next place, to confider in what order, proportion, and meafure of thofe inward principles, virtue, or a found moral temper and right conduct, confifts; that we may difcover whence moral obligations arife.

Of Duty, or Moral Obligation.

It is by the end or defign of any power or movement, that we muft direct it motions, and eftimate the degree of force neceffary to its juft action. If it want the force requifite for the obtaining its end, we reckon it defective; if it has too much, fo as to be carried beyond it, we fay it is over-charged; and in either cafe it is imperfect, and ill contrived. If it has juft enough to reach the fcope, we efteem it right, and as it fhould be. Let us apply this reafoning to the paffions.

The defence and fecurity of the individual being the aim of the defenfive paffions, that fecurity and defence muft be the meafure of their ftrength or indulgence. If they are fo weak as to prove infufficient for that end, or if they carry us beyond it, *i. e.* raife unneceffary commotions, or continue longer than is needful, they are unfit to anfwer their original defign, and therefore are in an unfound and unnatural ftate. The exercife of fear or of refentment has nothing defirable in it, nor can we give way to either without painful fenfations. Without a certain degree of them, we are naked and expofed: with too high a proportion of them, we are miferable, and often injurious to others. Thus cowardice or timidity, which is the excefs of fear, inftead of faving us in danger, gives it too formidable an appearance, makes us incapable of attending to the beft means of prefervation, and difarms us of courage our natural armour. Fool-hardinefs, which is the want of a due meafure of fear, leads us heedlefly into danger, and lulls us into a pernicious fecurity. Revenge, *i. e.* exceffive refentment, by the violence of its commotion, robs us of that prefence of mind which is often the beft guard againft injury, and inclines us to purfue the aggreffor with more feverity than felf-defence requires. Pufillanimity, or the want of a juft indignation againft wrong, leaves us quite unguarded, and tends to fink the mind into a paffive enervated tamenefs. Therefore, "to keep the defenfive paffions duly proportioned to our dangers, is their natural pitch and tenor."

The private paffions lead us to purfue fome pofitive fpecies of private good. That good, therefore, which is the object and end of each, muft be the meafure of their refpective force, and direct their operation. If they are too weak or fluggifh to engage us in the purfuit of their feveral objects, they are evidently deficient; but if they defeat their end by their impetuofity, then are they ftrained beyond the juft tone of nature. Thus vanity, or an exceffive paffion for applaufe, betrays into fuch meanneffes and little arts of popularity, as makes us forfeit the honour we fo anxioufly court. On the other hand, a total indifference about the efteem of mankind, removes a ftrong guard and fpur to virtue, and lays the mind open to the moft abandoned profecutions. Therefore, "to keep our private paffions and defires proportioned to our wants, is the juft meafure and pitch of this clafs of affections."

The defenfive and private paffions do all agree in general in their tendency or conducivenefs to the intereft or good of the individual. Therefore, when there is a collifion of interefts, as may fometimes happen, that aggregate of good or happinefs, which is compofed of the particular goods to which they refpectively tend, muft be the common ftandard by which their comparative degrees of ftrength are to be meafured. That is to fay, if any of them, in the degree in which they prevail, are incompatible with the greateft aggregate of good, or moft extenfive intereft of the individual, then are they unequal and difproportionate. For, in judging of a particular fyftem or conftitution of powers, we call that the fupreme or principal end, in which the aims of the feveral parts or powers coincide, and to which they are fubordinate; and reckon them in due proportion to each other, and right with regard to the whole, when they maintain that fubordination or fubferviency. Therefore, "to proportion our defenfive and private paffions in fuch meafure to our dangers and wants, as beft to fecure the individual, and obtain the greateft aggregate of private good or happinefs, is their juft balance or comparative ftandard in cafe of competition."

In like manner, as the public or focial affections point at the good of others, that good muft be the meafure of their force. When a particular focial affection, as gratitude or friendfhip, which belongs to a particular focial connection, *viz.* that of a benefactor or of a friend, is too feeble to make us act the grateful or friendly part; that affection, being infufficient to anfwer its end, is defective and unfound. If, on the other hand, a particular paffion of this clafs counteract or defeat the intereft it is defigned to promote, by its violence or difproportion, then is that paffion exceffive and irregular. Thus natural affection, if it degenerates into a paffionate fondnefs, not only hinders the parents from judging coolly of the intereft of their offspring, but often leads them into a moft partial and pernicious indulgence.

As every kind affection points at the good of its particular object, it is poffible there may be fometimes a collifion of interefts or goods. Thus the regard due to a friend may interfere with that which we owe to a community. In fuch a competition of interefts, it is evident, that the greateft is to be chofen; and that is the greateft intereft, which contains the greateft fum or aggregate of public good, greateft in quantity as well as duration. This then is the common ftandard, by which the refpective forces and fubordinations of the focial affections muft be adjufted. Therefore we conclude, that this "clafs of affections are found and regular, when they prompt us to purfue the intereft of individuals in an entire confiftency with the public good:" or, in other words, "when they are duly proportioned to the dangers and wants of others, and to the various relations in which we ftand to individuals, or to fociety."

Thus we have found, by an induction of particulars, the natural pitch or tenor of the different orders of affection, confidered apart by themfelves. Now as the virtue or perfection of every creature lies in following its nature, or

or acting ſuitably to the juſt proportion and harmony of its ſeveral powers; therefore, "the virtue of a creature endowed with ſuch affections as man, muſt conſiſt in obſerving or acting agreeably to their natural pitch and tenor."

But, as there are no independent affections in the fabrick of the mind, no paſſion that ſtands by itſelf without ſome relation to the reſt, we cannot pronounce of any one, conſidered apart, that it is either too ſtrong or too weak. Its ſtrength and juſt proportion muſt be meaſured, not only by its ſubſerviency to its own immediate end, but by the reſpect it bears to the whole ſyſtem of affection. Therefore, we ſay a paſſion is too ſtrong, not only when it defeats its own end, but when it impairs the force of other paſſions, which are equally neceſſary to form a temper of mind ſuited to a certain œconomy or ſtate; and too weak, not merely on account of its inſufficiency to anſwer its end, but becauſe it cannot ſuſtain its part or office in the balance of the whole ſyſtem. Thus the love of life may be too ſtrong, when it takes from the regard due to one's country, and will not allow one bravely to encounter dangers, or even death, on its account. Again, the love of fame may be too weak, when it throws down the fences which render virtue more ſecure, or weakens the incentives which make it more active and publick-ſpirited.

If it be aſked, "How far may the affections towards private good or happineſs be indulged?" one limit was before fixed for the particular indulgencies of each, *viz.* their ſubordination to the common aggregate of good to the private ſyſtem. In theſe therefore, a due regard is always ſuppoſed to be had to health, reputation, fortune, the freedom of action, the unimpaired exercife of reaſon, the calm enjoyment of one's ſelf, which are all private goods. Another limit now reſults from the balance of affection juſt named, *viz.* "The ſecurity and happineſs of others;" or, to expreſs it more generally, "a private affection may be ſafely indulged, when, by that indulgence, we do not violate the obligations which reſult from our higher relations, or public connections." A juſt reſpect therefore being had to theſe boundaries, which nature has fixed in the breaſt of every man, What ſhould limit our purſuits of private happineſs? Is nature ſullen and penurious? Or does the God of nature envy the happineſs of his offspring?

Whether there is ever a real colliſion of intereſts between the public and private ſyſtem of affections, or the ends which each claſs has in view, will be afterwards conſidered; but where there is no colliſion, there is little or no danger of carrying either, but eſpecially the public affection, to exceſs, provided both kinds are kept ſubordinate to a diſcreet and cool ſelf-love, and to a calm and univerſal benevolence; which principles ſtand as guards at the head of each ſyſtem.

This then is the conduct of the paſſions, conſidered as particular and ſeparate forces, carrying us out to their reſpective ends; and this is their balance or œconomy, conſidered as compound powers, or powers mutually related, acting in conjunction towards a common end, and conſequently as forming a ſyſtem or whole.

Now, whatever adjuſts or maintains this balance, whatever in the human conſtitution is formed for directing the paſſions, ſo as to keep them from defeating their own end or interfering with each other, muſt be a principle of a ſuperior nature to them, and ought to direct their meaſures, and govern their proportions. But it was found, that reaſon or reflection is ſuch a principle, which points out the tendency of our paſſions, weighs their influence upon private and public happineſs, and ſhews the beſt means of attaining either. It having been likewiſe found, that there is another directing or controuling principle, which we call conſcience, or the moral ſenſe, which, by a native kind of authority, judges of affections and actions, pronouncing ſome juſt and good, and others unjuſt and ill; it follows, that the paſſions, which are mere impulſes, or blind forces, are principles inferior and ſubordinate to this judging faculty. Therefore, if we would obſerve the mutual reſpects and the ſubordination which the different parts of the human conſtitution bear one to another, the paſſions ought to be ſubjected to the direction and authority of the leading or controuling principles.

We conclude therefore from this induction, that "the conſtitution or juſt œconomy of human nature conſiſts in a regular ſubordination of the paſſions and affections to the authority of conſcience, and the direction of reaſon."

That ſubordination is regular, when the proportion formerly mentioned is maintained; that is to ſay, "When the defenſive paſſions are kept proportioned to our dangers; when the private paſſions are proportioned to our wants; and when the public affections are adapted to our public connections, and proportioned to the wants and dangers of others."

But the natural ſtate, or the ſound and vigorous conſtitution, of any creature, or the juſt œconomy of its powers, we call its health and perfection; and the acting agreeably to theſe, its virtue or goodneſs. Therefore, "the health and perfection of man muſt lie in the aforeſaid ſupremacy of conſcience and reaſon, and in the ſubordination of the paſſions to their authority and direction; and his virtue or goodneſs muſt conſiſt in acting agreeably to that order or œconomy."

That ſuch an œconomy of the mind, and ſuch a conduct of its power and paſſions, will ſtand the teſt of reaſon, cannot admit of any diſpute. For, upon a fair examination into the conſequences of things, or the relations and aptitudes of means to ends, reaſon evidently demonſtrates, and experience confirms it, that "to have our defenſive paſſions duly proportioned to our dangers, is the ſureſt way to avoid or get clear of them, and obtain the ſecurity we ſeek after."—"To proportion our private paſſions to our wants, is the beſt means to ſupply them;—and, to adapt our public affections to our ſocial relations and the good of others, is the moſt effectual method of fulfilling one, and procuring the other." In this ſenſe, therefore, virtue may be ſaid to be a "conduct conformable to reaſon, as reaſon diſcovers an apparent aptitude in ſuch an order and œconomy of powers and paſſions to anſwer the end for which they are naturally formed.

If the idea of moral obligation is to be deduced merely from this aptitude or connection between certain paſſions, or a certain order and balance of paſſions, and certain ends

ends obtained or to be obtained by them; then is reason or reflection, which perceives that aptitude or connection, the proper judge of moral obligation; and on this supposition it may be defined, "the connection between the affection and the end, or between the action and the motive:" for the end is the motive, or the final cause; and the affection is the action, or its immediate natural cause. A man, from mere self love, may be induced to fulfil that obligation which is founded on the connection between the defensive passions and their ends, or the private passions and their ends; because, in that case, his own interest will prompt him to indulge them in the due proportion required. But if he has no affections which point beyond himself, no principle but self-love or some subtle modification of it, what shall interest him in the happiness of others, where there is no connection between it and his own? or what sense can he have of moral obligation to promote it? Upon this scheme therefore, without publick or social affections there could be no motive, and consequently no moral obligation, to a beneficent disinterested conduct.

But if the mere connection between certain passions, or a certain order of passions, and certain ends, is what constitutes or gives us the idea of moral obligation; then why may not the appositeness of any temper or conduct, nay, of any piece of machinery, to obtain its end, form an equally strict moral obligation? For the connection and aptitude are as strong and invariable in the latter instances as in the former. But as this is confounding the most obvious differences of things, we must trace the idea of moral obligation to another and a more natural source.

Let us appeal therefore to sense and experience, "how we stand affected to those different sets of passions in the just measure and balance of which we found a right temper to consist." For this is entirely a matter of experience, in which we must examine, as in any other natural inquiry, "what are the genuine feelings and operations of nature, and what affections or symptoms of them appear in the given instance."

The defensive passions, as anger and fear, give us rather pain than pleasure; yet we cannot help feeling them when provoked by injury or exposed to harm. We account the creature imperfect that wants them, because they are necessary to his defence. Nay, we should in some measure condemn ourselves, did we want the necessary degree of resentment and caution. But if our resentment exceeds the wrong received, or our caution the evil dreaded, we then blame ourselves for having over acted our part. Therefore, while we are in danger, to be totally destitute of them we reckon a blameable defect, and to feel them in a just, *i. e.* necessary measure, we approve, as suited to the nature and condition of such a creature as man. But, our security obtained, to continue to indulge them, we not only disapprove as hurtful, but condemn as unmanly, unbecoming, and mean-spirited: Nor will such a conduct afford any self-approving joy, when we coolly reflect upon it.

With regard to the private passions, such as love of life, pleasure, ease, and the like; as these aim at private good, and are necessary to the perfection and happiness of the individual, we should reckon any creature defective, and even blameable, that was destitute of them. Thus, we condemn the man who imprudently ruins his fortune, impairs his health, or exposes his life; we not only pity him as an unfortune creature, but feel a kind of moral indignation and contempt of him, for having made himself such. On the other hand, though a discreet self regard does not attract our esteem and veneration, yet we approve of it in some degree, in an higher and different degree from what we would regard a well-contrived machine as necessary to constitute a finished creature, nay, to complete the virtuous character, and as exactly suited to our present indigent state. There are some passions respecting private good, towards which we feel higher degrees of approbation; as the love of knowledge, of action, of honour, and the like. We esteem them as marks of an ingenious mind, and cannot help thinking the character in which they are wanting remarkably stupid, and in some degree immoral.

With regard to the social affections, as compassion, natural affection, friendship, benevolence, and the like, we approve, admire, and love them in ourselves, and in all in whom we discover them, with an esteem and approbation, if not different in kind, yet surely far superior in degree to what we feel towards the other passions. These we reckon necessary, just, and excellently fitted to our structure and state; and the creature which wants them we call defective, ill-constituted, a kind of abortion. But the public affections we esteem as self-worthy, originally and eternally amiable.

But among the social affections, we make an obvious and constant distinction, *viz.* between those particular passions, which urge us with a sudden violence, and uneasy kind of sensation, to pursue the good of their respective objects, as pity, natural affection, and the like; and those calm dispassionate affections and desires which prompt us more steadily and uniformly to promote the happiness of others. The former we generally call *passions*; to distinguish them from the other sort, which go more commonly by the name of *affections*, or *calm desires*. The first kind we approve indeed, and delight in; but we feel still higher degrees of approbation and moral complacence towards the last, and towards all limitations of the particular instincts, by the principle of universal benevolence. The more objects the calm affections take in, and the worthier these are, their dignity rises in proportion, and with this our approbation keeps an exact pace. A character, on the other hand, which is quite divested of these public affections, which feels no love for the species, but, instead of it, entertains malice, rancour, and ill-will, we reckon totally immoral and unnatural.

Such then are the sentiments and dispositions we feel, when these several orders of affection pass before the mental eye.

Therefore, "that state in which we feel ourselves moved, in the manner above described, towards those affections and passions, as they come under the mind's review, and in which we are instantaneously, and independently of our choice or volition, prompted to a correspondent conduct, we call a state of moral obligation." Let us suppose, for instance, a parent, a friend, a benefactor, reduced

duced to a condition of the utmoſt indigence and diſtreſs, and that it is in our power to give them immediate relief. To what conduct are we obliged? what duty does nature dictate and require in ſuch a caſe? Attend, and nature will tell with a voice irreſiſtibly audible and commanding to the human heart, "that immediate relief ought to be given." Again, let a friend, a neighbour, or even a ſtranger, have lodged a depoſit in our hands, and after ſome time reclaim it; no ſooner do theſe ideas of the confidence repoſed in us, and of property not transferred but depoſited, occur, than we immediately and unavoidably feel and recognize the obligation to reſtore it. In both theſe caſes, we ſhould condemn ourſelves, if we acted otherwiſe, as having done, or omitted doing, what we ought not;—as having acted beneath the dignity of our nature,—contrary to our moſt intimate ſenſe of right and wrong:—we ſhould accuſe ourſelves as guilty of ingratitude, injuſtice, and inhumanity;—and be conſcious of deſerving the cenſure, and therefore dread the reſentment, of all rational beings,—But in complying with the obligation, we feel joy and ſelf-approbation,—are conſcious of an inviolable harmony between our nature and duty,—and think ourſelves entitled to the applauſe of every impartial ſpectator of our conduct.

To deſcribe therefore what we cannot perhaps define, a ſtate of moral obligation, is "that ſtate in which a creature, endued with ſuch ſenſes, powers, and affections as man, would condemn himſelf, and think he deſerved the condemnation of all others, ſhould he refuſe to fulfil it; but would approve himſelf, and expect the approbation of all others, upon complying with it."

And we call him a moral agent, who is in ſuch a ſtate, or is ſubject to moral obligation. Therefore as man's ſtructure and connections often ſubject him to ſuch a ſtate of moral obligation, we conclude that he is a moral agent. But as man may ſometimes act without knowing what he does, as in caſes of frenzy or diſeaſe, or in many natural functions; or, knowing what he does, he may act without choice or affection, as in caſes of neceſſity or compulſion; therefore, to denominate an action moral, *i. e.* approveable, or blameable, it muſt be done knowingly and willingly, or from affection and choice. A morally good action, then, is "to fulfil a moral obligation knowingly and willingly;" and a morally bad action, or an immoral action, is "to violate a moral obligation knowingly and willingly."

As not an action, but a ſeries of actions conſtitute a character; as not an affection, but a ſeries of affections conſtitute a temper; and as we denominate things by the groſs, *à fortiori*, or by the qualities which chiefly prevail in them: "therefore we call that a morally good character, in which a ſeries of morally good actions prevail; and that a morally good temper, in which a ſeries of morally good affections have the aſcendant." A bad character and bad temper are the reverſe. But where the above mentioned order or proportion of paſſions is maintained, there a ſeries of morally good affections and actions will prevail. Therefore, "to maintain that order and proportion, is to have a morally good temper and character." But a "morally good temper and character is moral rectitude, integrity, virtue, or the completion of duty."

If it be aſked, after all, "How we come by the idea of moral obligation or duty?" we may anſwer, that we come by it in the ſame way as by our other original and primary perceptions. We receive them all from nature, or the great Author of nature. For this idea of moral obligation is not a creature of the mind, or dependent on any previous act of volition; but ariſes on certain occaſions, or when certain other ideas are preſented to the mind, as neceſſarily, inſtantaneouſly, and unavoidably, as pain does upon too near an approach to the fire, or pleaſure from the fruition of any good. It does not, for inſtance, depend on our choice, whether we ſhall feel the obligation to ſuccour a diſtreſſed parent, or to reſtore a depoſit intruſted to us when it is recalled. We cannot call this a compound idea made up of one or more ſimple ideas. We may indeed, nay, we muſt, have ſome ideas antecedent to it, *e. g.* that of a parent—in diſtreſs—of a child—able to relieve—of the relation of one to the other,—of a truſt,—of right, *&c.* But none of theſe ideas conſtitute the perception of obligation. Theſe indeed, by a law of our nature, are the occaſion of ſuggeſting it; but they are as totally different from it, as colours are from ſounds. By ſenſe or reflection we perceive the correlatives, our memory recalls the favours or depoſit we received, the various circumſtances of the caſe are matters of fact or experience; but ſome delicate inward organ or power, or call it what we pleaſe, does, by a certain inſtantaneous ſympathy, antecedent to the cool deductions of reaſon, and independent of previous inſtruction, art, or volition, perceive the moral harmony, the living irreſiſtible charm of moral obligation, which immediately intereſts the correſpondent paſſions, and prompts us to fulfil its awful dictates.

We need not apprehend any danger from the quickneſs of its deciſions; nor be frightened, becauſe it looks like inſtinct, and has been called ſo. Would we approve one for deliberating long, or reaſoning the matter much at leiſure, whether he ſhould relieve a diſtreſſed parent, feed a ſtarving neighbour, or reſtore the truſt committed to him? Should we not ſuſpect the reaſoner of knavery, or of very weak affections to virtue? We employ reaſon in examining the condition, relations, and other circumſtances of the agent or patient, or of thoſe with whom either of them are connected, or, in other words, the ſtate of the caſe; and in complicated caſes, where the circumſtances are many, it may require no ſmall attention to find the true ſtate of the caſe: but when the relations of the agent or patient, and the circumſtances of the actions, are obvious, or come out ſuch after a fair trial, we ſhould ſcarce approve him who demurs on the obligation to that conduct which the caſe ſuggeſts.

From what has been ſaid it is evident, that it is not the pleaſure or agreeable ſenſations which accompany the exerciſe of the ſeveral affections, nor thoſe conſequent to the actions, that conſtitute moral obligation, or excite in us the idea of it. That pleaſure is poſterior to the idea of obligation; and frequently we are obliged, and acknowledge ourſelves under an obligation, to ſuch

affections

affections and actions as are attended with pain; as in the trials of virtue, where we are obliged to facrifice private to public good, or a prefent pleafure to a future intereft. We have pleafure in ferving an aged parent, but it is neither the perception nor profpect of that pleafure which gives us the idea of obligation to that conduct.

The Final *Caufes of our* Moral *Faculties of* Perception *and* Affection.

We have now taken a general profpect of man, and of his moral powers and connections; and on thefe erected a fcheme of duty, or moral obligation, which feems to be confirmed by experience, confonant to reafon, and approved by his moft inward and moft facred fenfes. It may be proper, in the next place, to take a more particular view of the final caufes of thofe delicate fprings by which he is impelled to action, and of thofe clogs by which he is reftrained from it.——By this detail we fhall be able to judge of their aptitude to anfwer their end, in a creature endued with his capacities, fubject to his wants, expofed to his dangers, and fufceptible of his enjoyments; and from thence, we fhall be in condition to pronounce concerning the end of his whole ftructure, its harmony with his ftate, and confequently its fubferviency to anfwer the great and benevolent intentions of its author.

The fupreme being has feen fit to blend in the whole of things a prodigious variety of difcordant and contrary principles, light and darknefs, pleafure and pain, good and evil. There are multifarious natures, higher and lower, and many intermediate ones between the wide-diftant extremes. Thefe are differently fituated, varioufly adjufted, and fubjected to each other; and all of them fubordinate to the order and perfection of the whole. We may fuppofe man placed as in a centre amidft thofe innumerable orders of beings; by his outward frame drawn to the material fyftem, and by his inward connected with the intellectual or moral, and of courfe affected by the laws which govern both, or affected by that good and all that ill which refult from thofe laws. In this infinite variety of relations with which he is furrounded, and of contingencies to which he is liable, he feels ftrong attractions to the good, and violent repulfions or averfions to the ill. But as good and ill are often blended, and wonderfully complicated one with the other; as they fometimes immediately produce and run up into each other, and at other times lie at great diftances, yet, by means of intervening links, introduce one another; and as thefe effects are often brought about in confequence of hidden relations, and general laws, of the energy of which he is an incompetent judge; it is eafy for him to miftake good for evil, and evil for good; and confequently he may be frequently attracted by fuch things as are deftructive, or repel fuch as are falutary. Thus, by the tender and complicated frame of his body, he is fubjected to a great variety of ills, to ficknefs, cold, heat, fatigue, and innumerable wants. Yet his knowledge is fo narrow withal, and his reafon fo weak, that in many cafes he cannot judge, in the way of inveftigation, or reafoning, of the connections of thofe effects with their refpective caufes, or of the various latent energies of natural things. He is therefore informed of this connection by the experience of certain fenfes, or organs of perception, which, by a mechanical inftantaneous motion, feel the good and the ill, receiving pleafure from one, and pain from the other. By thefe, without any reafoning, he is taught to attract or chufe what tends to his welfare, and to repel and avoid what tends to his ruin. Thus, by his fenfes of tafte and fmell, or by the pleafure he receives from certain kinds of food, he is admonifhed which agree with his conftitution, and, by an oppofite fenfe of pain, he is informed which forts difagree, or are deftructive of it; but is not by means of thefe inftructed in the inward natures and conftitutions of things.

Some of thofe fenfes are armed with ftrong degrees of uneafinefs or pain, in order to urge him to feek after fuch objects as are fuited to them. And thefe refpect his more immediate and preffing wants; as the fenfe of hunger, thirft, cold, and the like; which by their painful importunities, compel him to provide food, drink, raiment, fhelter. Thofe inftincts by which we are thus prompted, with fome kind of commotion or violence, to attract and purfue good, or to repel and avoid ill, we call appetites and paffions. By our fenfes then we are informed of what is good or ill to the private fyftem, or the individual; and by our private appetites and paffions we are impelled to one, and reftrained from the other.

In confequence of this machinery, and the great train of wants to which our nature fubjects us, we are engaged in a continued feries of occupations, which often require much application of thought, or great bodily labour, or both. The neceffaries of life, food, cloaths, fhelter, and the like, muft be provided; conveniencies muft be acquired to render life ftill more eafy and comfortable. In order to obtain thefe, arts, induftry, manufactures, and trade are neceffary: and to fecure to us the peaceable enjoyment of their fruits, civil government, policy, and laws muft be contrived, and the various bufinefs of public life carried on. Thus while man is concerned and bufied in making provifion, or obtaining fecurity for himfelf, he is by degrees engaged in connections with a family, friends, neighbours, a community, or a commonwealth. Hence arife new wants, new interefts, new cares, and new employments. The paffions of one man interfere with thofe of another. Interefts are oppofed. Competitions arife; contrary courfes are taken. Difappointments happen, diftinctions are made, and parties formed. This opens a vaft fcene of diftraction and embarraffment, and introduces a mighty train of good and ill, both public and private. Yet amidft all this confufion and hurry, plans of action muft be laid, confequences forefeen or guarded againft, inconveniencies provided for; and frequently particular refolutions muft be taken, and fchemes executed, without reafoning or delay.

Now, what provifion has the Author of our nature made for this neceffitous condition? How has he fitted the actor, man, for playing his part in this perplexed and bufy fcene?

Our fupreme Parent, watchful for the whole, has not left himfelf without a witnefs here neither, and hath made nothing imperfect, but all things are double one againft another. He has not left man to be informed, only by the cool notices of reafon, of the good or ill, the happinefs or mifery of his fellow-creatures. He has made

made him ſenſible of their good and happineſs, but eſpecially of their ill and miſery, by an immediate ſympathy, or quick feeling of pleaſure and of pain.

The latter we call pity or compaſſion. For the former, though every one who is not quite diveſted of humanity feels it in ſome degree, we have not got a name, unleſs we call it congratulation, or joyful ſympathy, or that good humour which ariſes on ſeeing others pleaſed or happy. Both theſe feelings have been called, in general, the public or common ſenſe, by which we feel for others, and are intereſted in their concerns as really, though perhaps leſs ſenſibly, than in our own.

When we ſee our fellow-creatures unhappy through the fault or injury of others, we feel reſentment or indignation againſt the unjuſt cauſers of that miſery. If we are conſcious that it has happened through our fault or injurious conduct, we feel ſhame; and both theſe claſſes of ſenſes and paſſions, regarding miſery and wrong, are armed with ſuch ſharp ſenſations of pain, as not only prove a powerful guard and ſecurity to the ſpecies, or public ſyſtem, againſt thoſe ills it may, but ſerve alſo to leſſen or remove thoſe ills it does, ſuffer. Compaſſion draws us out of ourſelves to bear a part of the misfortunes of others, powerfully ſolicits us in their favour, melts us at ſight of their diſtreſs, and makes us in ſome degree unhappy till they are relieved from it. It is peculiarly well adapted to the condition of human life, becauſe it is much more and oftener in our power to do miſchief than good, and to prevent or leſſen miſery than to communicate poſitive happineſs; and therefore it is an admirable reſtraint upon the more ſelfiſh paſſions, or thoſe violent impulſes that carry us to the hurt of others.

There are other particular inſtincts or paſſions, which intereſt us in the concerns of others, even while we are moſt buſy about our own, and which are ſtrongly attractive of good, and repulſive of ill to them. Such are natural affection, friendſhip, love, gratitude, deſire of fame, love of ſociety, of one's country. Now as the private appetites and paſſions were found to be armed with ſtrong ſenſations of deſire and uneaſineſs, to prompt man the more effectually to ſuſtain labours, and encounter dangers, in purſuit of thoſe goods that are neceſſary to the preſervation and welfare of the individual, and to avoid thoſe ills which tend to his deſtruction; in like manner it was neceſſary that this other claſs of deſires and affections ſhould be prompted with as quick ſenſations of pain, not only to counteract the ſtrength of their antagoniſts, but to engage us in a virtuous activity for our relations, families, friends, neighbours, country. Indeed our ſenſe of right and wrong will admoniſh us that it is our duty, and reaſon and experience farther aſſure us that it is both our intereſt and beſt ſecurity, to promote the happineſs of others; but that ſenſe, that reaſon, and that experience, would frequently prove but weak and ineffectual prompters to ſuch a conduct, eſpecially in caſes of danger and hardſhip, and amidſt all the importunities of nature, and that conſtant hurry in which the private paſſions involve us, without the aid of thoſe particular kind affections, which mark out to us particular ſpheres of duty, and with an agreeable violence engage and fix us down to them.

It is evident therefore, that theſe two claſſes of affection, the private and public, are ſet one againſt the other, and deſigned to controul and limit each others influence, and thereby to produce a juſt balance in the whole. In general, the violent ſenſations of pain or uneaſineſs which accompany hunger, thirſt, and the other private appetites, or too great fatigue of mind as well as of body, prevent the individual from running to great exceſſes in the exerciſe of the higher functions of the mind; as too intenſe thought in the ſearch of truth, violent application to buſineſs of any kind, and different degrees of romantic heroiſm. On the other hand, the finer ſenſes of perception, and thoſe generous deſires and affections which are connected with them, the love of action, of imitation, of truth, honour, public virtue, and the like, are wiſely placed in the oppoſite ſcale, in order to prevent us from ſinking into the dregs of the animal life, and debaſing the dignity of man below the condition of brutes. So that by the mutual reaction of thoſe oppoſite powers, the bad effects are prevented that would naturally reſult from their acting ſingly and apart; and the good effects are produced which each are ſeverally formed to produce.

The ſame wholeſome oppoſition appears likewiſe in the particular counterworkings of the private and public affections one againſt the other. Thus compaſſion is adapted to counterpoiſe the love of eaſe, of pleaſure, and of life; and to diſarm, or to ſet bounds to reſentment: and reſentment of injury done to ourſelves or to our friends, prevents an effeminate compaſſion or conſternation; and gives us a noble contempt of labour, pain, and death. Natural affection, friendſhip, love of one's country, nay, zeal for any particular virtue, are frequently more than a match for the whole train of ſelfiſh paſſions. On the other hand, without that intimate over-ruling paſſion of ſelf-love, and thoſe private deſires which are connected with it, the ſocial and tender inſtincts of the human heart would degenerate into the wildeſt dotage, the moſt torturing anxiety, and downright frenzy.

But not only are the different orders or claſſes of affection checks one upon another, but paſſions of the ſame claſſes are mutual clogs. Thus, how many are withheld from the violent outrages of reſentment by fear? and how eaſily is fear controuled in its turn, while mighty wrongs awaken a mighty reſentment? The private paſſions often interefere, and therefore moderate the violence of each other; and a calm ſelf-love is placed at their head to direct, influence, and controul their particular attractions and repulſions. The public affections likewiſe reſtrain one the other; and all of them are put under the controul of a calm diſpaſſionate benevolence, which ought in like manner to direct and limit their particular motions.——Thus moſt part, if not all the paſſions have a twofold aſpect, and ſerve a twofold end. In one view they may be conſidered as powers, impelling mankind to a certain courſe, with a force proportioned to the apprehended moment of the good they aim at. In another view they appear as weights balancing the action of the powers, and controuling the violence of their impulſes. By means of theſe powers and weights a natural poiſe is ſettled in the human breaſt by its all-wiſe Author,

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by which the creature is kept tolerably ſteady and regular in his courſe, amidſt that variety of ſtages through which he muſt paſs.

But this is not all the proviſion which God has made for the hurry and perplexity of the ſcene in which man is deſtined to act. Amidſt thoſe infinite attractions and repulſions towards private and public good and ill, mankind either cannot often foreſee the conſequences or tendencies of all their actions towards one or other of theſe, eſpecially where thoſe tendencies are intricate and point different ways, or thoſe conſequences remote and complicated: or though, by careful and cool inquiry, and a due improvement of their rational powers, they might find them out; yet diſtracted as they are with buſineſs, amuſed with trifles, diſſipated by pleaſure, and diſturbed by paſſion, they either have, or can find, no leiſure to attend to thoſe conſequences, or to examine how far this or that conduct is productive of private or public good on the whole. Therefore, were it left entirely to the ſlow and ſober deductions of reaſon to trace thoſe tendencies and make out thoſe conſequences, it is evident, that, in many particular inſtances, the buſineſs of life muſt ſtand ſtill, and many important occaſions of action be loſt, or perhaps the greateſt blunders be commited. On this account the Deity, beſides that general approbation which we beſtow on every degree of kind affection, has moreover implanted in man many particular perceptions, or determinations, to approve of certain qualities or actions, which, in effect, tend to the advantage of ſociety, and are connected with private good, though he does not always ſee that tendency, nor mind that connection. And theſe perceptions or determinations do, without reaſoning, point out, and, antecedent to views of intereſt, prompt to a conduct beneficial to the public, and uſeful to the private ſyſtem. Such is that ſenſe of candor and veracity, that abhorrence of fraud and falſhood, that ſenſe of fidelity, juſtice, gratitude, greatneſs of mind, fortitude, clemency, decorum; and that diſapprobation of knavery, injuſtice, ingratitude, meanneſs of ſpirit, cowardice, cruelty and indecorum, which are natural to the human mind. The former of thoſe diſpoſitions, and the actions flowing from them, are approved, and thoſe of the latter kind diſapproved by us, even abſtracted from the view of their tendency or conduciveneſs to the happineſs or miſery of others or of ourſelves. In one we diſcern a beauty, a ſuperior excellency, a congruity to the dignity of man; in the other a deformity, a littleneſs, a debaſement of human nature.

There are other principles alſo, connected with the good of ſociety, or the happineſs and perfection of the individual, though that connection is not immediately apparent, which we behold with real complacency and approbation, though perhaps inferior in degree, if not in kind; ſuch as gravity, modeſty, ſimplicity of deportment, temperance, prudent oeconomy; and we feel ſome degree of contempt and diſlike where they are wanting, or where the oppoſite qualities prevail. Theſe and the like perceptions or feelings are either different modifications of the moral ſenſe, or ſubordinate to it, and plainly ſerve the ſame important purpoſe, being expeditious monitors in the ſeveral emergencies of a various and diſtracted life, of what is right, what is wrong, what is to be purſued, and what avoided; and, by the pleaſant or painful conſciouſneſs which attends them, exerting their influence as powerful prompters to a ſuitable conduct.

From a ſlight inſpection of the above-named principles, it is evident they all carry a friendly aſpect to ſociety and the individual, and have a more immediate or a more remote tendency to promote the perfection or good of both. This tendency cannot be always foreſeen, and would be often miſtaken, or ſeldom attended to by a weak, buſy, ſhort-ſighted creature, like man, both raſh and variable in his opinions, a dupe to his own paſſions or to the deſigns of others, liable to ſickneſs, to want, and to error. Principles, therefore, which are ſo nearly linked with private ſecurity and public good, by directing him, without operoſe reaſoning, where to find one, and how to promote the other, and by prompting him to a conduct conducive to both, are admirably adapted to the exigencies of his preſent ſtate, and wiſely calculated to obtain the ends of univerſal benevolence.

It were eaſy, by conſidering the ſubject in another light, to ſhew, in a curious detail of particulars, how wonderfully the inſide of man, or that aſtoniſhing train of moral powers and affections with which he is endued, is fitted to the ſeveral ſtages of that progreſſive and probationary ſtate, through which he is deſtined to paſs. As our faculties are narrow and limited, and riſe from very ſmall and imperfect beginnings, they muſt be improved by exerciſe, by attention, and repeated trials. And this holds true, not only of our intellectual, but of our moral and active powers. The former are liable to errors in ſpeculation, the latter to blunders in practice, and both often terminate in misfortunes and pains: and thoſe errors and blunders are generally owing to our paſſions, or to our too forward and warm admiration of thoſe partial goods they naturally purſue, or to our fear of thoſe partial ills they naturally repel. Thoſe misfortunes therefore lead us back to conſider where our miſconduct lay, and whence our errors flowed; and conſequently are ſalutary pieces of trial, which tend to enlarge our views, to correct and refine our paſſions, and conſequently improve both our intellectual and moral powers.—Our paſſions then are the rude materials of our virtue, which heaven has given us to work up, to refine and poliſh into an harmonious and divine piece of workmanſhip. They furniſh out the whole machinery, the calms and ſtorms, the lights and ſhades of human life. They ſhew mankind in every attitude and variety of character, and give virtue both its ſtruggles and its triumphs. To conduct them well in every ſtate, is merit; to abuſe or miſapply them, is demerit.

The different ſets of ſenſes, powers, and paſſions, which unfold themſelves in thoſe ſucceſſive ſtages, are both neceſſary, and adapted to that riſing and progreſſive ſtate. Enlarging views and growing connections require new paſſions and new habits; and thus the mind, by theſe continually expanding and finding a progreſſive exerciſe, riſes to higher improvements, and puſhes forward to maturity and perfection.

In this beautiful oeconomy and harmony of our ſtructure, both outward and inward, with that ſtate, we may

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at once discern the great lines of our duty traced out in the fairest and brightest characters, and contemplate with admiration a more august and marvellous scene of divine wisdom and goodness laid in the human breast, than we shall perhaps find in the whole compass of nature.

From this detail it appears, that man, by his original frame, is made for a temperate, compassionate, benevolent, active, and progressive state. He is stronly attractive of the good, and repulsive of the ills, which befall others as well as himself. He feels the highest approbation and moral complacence in those affections and in those actions which immediately and directly respect the good of others, and the highest disapprobation and abhorrence of the contrary. Besides these, he has many particular perceptions or instincts of approbation, which though perhaps not of the same kind with the others, yet are accompanied with correspondent degrees of affection, proportioned to their respective tendencies to the public good. Therefore, by acting agreeably to these principles, man acts agreeably to his structure, and fulfils the benevolent intentions of its Author.

The principal Distinctions of Duty or Virtue.

WE have now considered the constitution and connections of man; and on these erected a general system of duty or moral obligation, consonant to reason, approved by his most sacred and intimate sense, suitable to his mixed condition, and confirmed by the experience of mankind. We have also traced the final causes of his moral faculties and affections to those noble purposes they answer with regard both to the private and the public system.

From this induction it is evident, that there is one order or class of duties which man owes to himself; another to society; and a third to God.

The duties he owes to himself are founded chiefly on the defensive and private passions, which prompt him to pursue whatever tends to private good or happiness, and to avoid or ward off whatever tends to private ill or misery. Among the various goods which allure and solicit him, and the various ills which attack or threaten him, "To be intelligent and accurate in selecting one, and rejecting the other, or in preferring the most excellent goods, and avoiding the most terrible ills, when there is a competition among either, and to be discreet in using the best means to attain the goods and avoid the ills, is what we call prudence." This, in our inward frame, corresponds to sagacity, or a quickness of sense in our outward.—"To proportion our defensive passions to our dangers, we call fortitude;" which always implies "a just mixture of calm resentment or animosity, and well governed caution." And this firmness of mind answers to the strength and muscling of the body.—And "duly to adjust our private passions to our wants, or to the respective moment of the good we affect or pursue, we call temperance;" which does therefore always imply "a just balance or command of the passions."

The second class of duties arises from the public or social affections; "the just harmony or proportion of which to the dangers and wants of others, and to the several relations we bear, commonly goes by the name of justice." This includes the whole of our duty to society, to its parent, and the general polity of nature; particularly gratitude, friendship, sincerity, natural affection, benevolence, and the other social virtues. The virtues comprehended under the former class, especially prudence and fortitude, may likewise be transferred to this; and according to the various circumstances in which they are placed, and the more confined or more extensive sphere in which they operate, may be denominated private, oeconomical, or civil prudence, fortitude, *&c.* These direct our conduct with regard to the wants and dangers of those lesser or greater circles with which we are connected.

The third class of duties respects the Deity, and arises also from the public affections, and the several glorious relations which he sustains to us, as our creator, benefactor, law-giver, judge, *&c.*

We chose to consider this set of duties in the last place, because, though prior in dignity and excellency, they seem to be last in order of time, as thinking it the most simple and easy method to follow the gradual progress of nature, as it takes its rise from individuals, and spreads through the social system, and still ascends upwards, till at length it stretches to its almighty Parent and Head, and so terminates in those duties which are highest and best.

The duties resulting from these relations, are reverence, gratitude, love, resignation, dependence, obedience, worship, praise; which, according to the model of our finite capacities, must maintain some sort of proportion to the grandeur and perfection of the object whom we venerate, love, and obey. "This proportion or harmony, is expressed by the general name of piety or devotion;" which is always stronger or weaker, according to the greater or less apprehended excellency of its object. This sublime principle of virtue, is the enlivening soul which animates the moral system, and that cement which binds and sustains the other duties which man owes to himself or to society.

This then is the general temper and constitution of virtue, and these are the principal lines or divisions of duty. To those good dispositions, which respect the several objects of our duty, and to all actions which flow from such dispositions, the mind gives its sanction or testimony. And this sanction or judgment concerning the moral quality, or the goodness of actions or dispositions, moralists call conscience. When it judges of an action that is to be performed, it is called an antecedent conscience; and when it passes sentence on an action which is performed, it is called a subsequent conscience. The tendency of an action to produce happiness, or its external conformity to a law, is termed its material goodness; but the good dispositions from which an action proceeds, or its conformity to law in every respect, constitutes its formal goodness.

When the mind is ignorant or uncertain about the moment of an action, or its tendency to private or public good; or when there are several circumstances in the case, some of which being doubtful, render the mind dubious concerning the morality of the action; this is called a doubtful or scrupulous conscience: if it mistakes concerning

Fig. 1. Mus Porcellus or Guiney Pig

Fig. 2. Mus Aguti

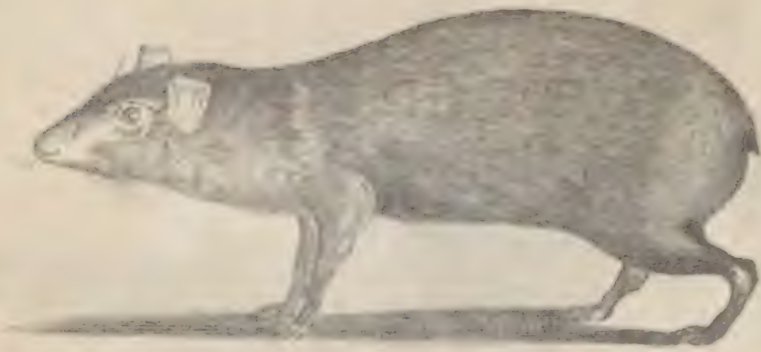

Fig. 3. Mus Avellonarius

A. Bell Sculp.

Fig. 1. MUS MARMOTTA
or Alpin Mouse.

Fig. 2. MUS VOLANS
or Flying Squirrel.

Fig. 3. MUSTELA LUTRA *or Otter.*

A. Bell Sculp.

Fig. 1. MUSTELA PUTORIUS *or Polecat.*

Fig. 2. MUSTELA FURO *or Ferret.*

Fig. 4. MYRMECOPHAGA.

Fig. 3 MUSTELA ERMINA *or Ermine.*

Fig. 5. MULLET.

A. B. Sc.

ing these, it is called an erroneous conscience. If the error or ignorance is involuntary or invincible, the action proceeding from that error, or from that ignorance, is reckoned innocent, or not imputable. If the error or ignorance is supine or affected, *i. e.* the effect of negligence, or of affectation and wilful inadvertence, the conduct flowing from such error, or such ignorance, is criminal and imputable. Not to follow one's conscience, though erroneous and ill-formed, is criminal, as it is the guide of life; and to counteract it, shews a depraved and incorrigible spirit: Yet, to follow an erroneous conscience is likewise criminal, if that error which misled the conscience was the effect of inattention, or of any criminal passion.

If it be asked, "How an erroneous conscience shall be rectified, since it is supposed to be the only guide of life, and judge of morals?" we answer, In the very same way that we would rectify reason, if at any time it should judge wrong, as it often does, *viz.* By giving it proper and sufficient materials for judging right, *i. e.* by inquiring into the whole state of the case; the relations, connections, and several obligations of the actor; the consequences, and other circumstances of the action; or the surplusage of private or public good which results, or is likely to result, from the action or from the omission of it. If those circumstances are fairly and fully stated, the conscience will be just and impartial in its decision. For, by a necessary law of our nature, it approves, and is well affected to the moral form; and if it seems to approve of vice or immorality, it is always under the notion or mask of some virtue. So that, strictly speaking, it is not conscience which errs; for its sentence is always conformable to the view of the case which lies before it; and is just, upon the supposition that the case is truly such as it is represented to it. All the fault is to be imputed to the agent, who neglects to be better informed, or who, thro' weakness or wickedness, hastens to pass sentence from an imperfect evidence.

Of Man's Duty to HIMSELF. *Of the Nature of* GOOD, *and the* CHIEF GOOD.

EVERY creature, by the constitution of his nature, is determined to love himself, to pursue whatever tends to his preservation and happiness, and to avoid whatever tends to his hurt and misery. Being endued with sense and perception, he must necessarily receive pleasure from some objects, and pain from others. Those objects which give pleasure are called good, and those which give pain evil. To the former he feels that attraction or motion we call desire, or love: To the latter that impulse we call aversion or hatred. To objects which suggest neither pleasure nor pain, and are apprehended of no use to procure one, or ward off the other, we feel neither desire nor aversion; and such objects are called indifferent. Those objects which do not of themselves produce pleasure or pain, but are the means of procuring either, we call useful or noxious. Towards them we are affected in a subordinate manner, or with an indirect and reflective, rather than a direct and immediate affection. All the original and particular affections of our nature, lead us out to, and ultimately rest in, the first kind of objects, *viz.* those which give immediate pleasure, and which we therefore call good, directly so. The calm affection of self-love alone is conversant about such objects as are only consequentially good, or merely useful to ourselves.

But besides those sorts of objects which we call good, merely and solely as they give pleasure, or are means of procuring it, there is an higher and nobler species of good, towards which we feel that peculiar movement we call approbation or moral complacency, and which we therefore denominate moral good. Such are our affections, and the consequent actions to them. The perception of this is quite distinct in kind from the perception of the other species; and though it may be connected with pleasure or advantage by the benevolent constitution of nature, yet it constitutes a good independent of that pleasure and that advantage, and far superior, not in degree only, but in dignity, to both. The other, *viz.* the natural good, consists in obtaining those pleasures which are adapted to the peculiar senses and passions susceptible of them, and is as various as are those senses and passions. This, *viz.* the moral good, lies in the right conduct of the several senses and passions, or their just proportion and accommodation to their respective objects and relations; and this is of a more simple and invariable kind.

By our several senses we are capable of a great variety of pleasing sensations. These constitute distinct ends or objects ultimately pursuable for their own sake. To these ends, or ultimate objects, correspond peculiar appetites or affections, which prompt the mind to pursue them. When these ends are attained, there it rests and looks no farther. Whatever therefore is pursuable, not on its own account, but as subservient or necessary to the attainment of something else that is intrinsically valuable or for its own sake, we call a mean, and not an end. So that ends, and not means, constitute the materials or the very essence of our happiness. Consequently, happiness cannot be one simple uniform thing in creatures constituted, as we are, with such various senses of pleasure, or such different capacities of enjoyment. Now, the same principle or law of our nature which determines us to pursue any one end or species of good, prompts us to pursue every other end or species of good of which we are susceptible, or to which our Maker has adapted an original propension. But amidst the great multiplicity of ends or goods, which form the various ingredients of our happiness, we perceive an evident gradation or subordination, suited to that gradation of senses, powers, and passions, which prevails in our mixed and various constitution, and to that ascending series of connections which open upon us in the different stages of our progressive state.

Thus the goods of the body, or of the external senses, seem to hold the lowest rank in this gradation or scale of goods. These we have in common with the brutes: and though many men are brutish enough to pursue the goods of the body with a more than brutal fury; yet when at any time they come in competition with goods of an higher order, the unanimous verdict of mankind, by giving the last the preference, condemns the first to the meanest

meaneft place. Goods confifting in exterior focial connections, as fame, fortune, power, civil authority, feem to fucceed next, and are chiefly valuable as the means of procuring natural or moral good, but principally the latter. Goods of the intellect are ftill fuperior; as tafte, knowledge, memory, judgment, *&c.* The higheft are moral goods of the mind, directly and ultimately regarding ourfelves; as command of the appetites and paffions, prudence, fortitude, benevolence, *&c.* Thefe are the great objects of our purfuit, and the principal ingredients of our happinefs. Let us confider each of them, as they rife one above the other in this natural feries or fcale, and touch briefly on our obligations to purfue them.

Thofe of the body are health, ftrength, agility, hardinefs, and patience of change, neatnefs, and decency.

Good health, and a regular eafy flow of fpirits, are in themfelves fweet natural enjoyments, a great fund of pleafure, and indeed the proper feafoning which gives a flavour and poignancy to every other pleafure. The want of health unfits us for moft duties of life, and is efpecially an enemy to the focial and human affections, as it generally renders the unhappy fufferer peevifh and fullen, difgufted at the allotments of providence, and confequently apt to entertain fufpicious and gloomy fentiments of its Author. It obftructs the free exercife and full improvement of our reafon, makes us a burden to our friends, and ufelefs to fociety. Whereas the uninterrupted enjoyment of good health, is a conftant fource of good humour: and good humour is a great friend to opennefs and benignity of heart; enables us to encounter the various ills and difappointments of life with more courage, or to fuftain them with more patience; and, in fhort, conduces much, if we are otherwife duly qualified, to our acting our part in every exigency of life with more firmnefs, confiftency, and dignity. Therefore it imports us much to preferve and improve an habit or enjoyment, without which every other external entertainment is taftelefs, and moft other advantages of little avail. And this is beft done by a ftrict temperance in diet and regimen, by regular exercife, and by keeping the mind ferene and unruffled by violent paffions, and unfubdued by intenfe and conftant labours, which greatly impair, and gradually deftroy, the ftrongeft conftitutions.

Strength, agility, hardinefs, and patience of change, fuppofe health, and are unattainable without it; but they imply fomething more, and are neceffary to guard it, to give us the perfect ufe of life and limbs, and to fecure us againft many otherwife unavoidable ills. The exercife of the neceffary manual, and of moft the elegant arts of life, depends on ftrength and agility of body; perfonal dangers, private and public dangers, the demands of our friends, our families and country require them; they are neceffary in war, and ornamental in peace; fit for the employments of a country and a town life, and they exalt the entertainments and diverfions of both. They are chiefly obtained by moderate and regular exercife.

Few are fo much raifed above want and dependence, or fo exempted from bufinefs and care, as not to be often expofed to inequalities and changes of diet, exercife, air, climate, and other irregularities. Now, what can be fo effectual to fecure one againft the mifchiefs arifing from fuch unavoidable alterations, as hardinefs, and a certain verfatility of conftitution, which can bear extraordinary labours, and fubmit to great changes, without any fenfible uneafinefs or bad confequences. This is beft attained, not by an over great delicacy and minute attentions to forms, or by an invariable regularity in diet, hours, and way of living, but rather by a bold difcreet latitude of regimen. Befides, deviations from eftablifhed rules and forms of living, if kept within the bounds of fobriety and reafon, are friendly to thought and original fentiment, animate the dull fcene of ordinary life and bufinefs, and agreeably ftir the paffions, which ftagnate or breed ill humour in the calms of life.

Neatnefs, cleanlinefs, and decency, to which we may add dignity of countenance and demeanour, feem to have fomething refined and moral in them. At leaft we generally efteem them indications of an orderly, genteel, and well governed mind, confcious of inward worth, or the refpect due to one's nature. Whereas naftinefs, flovenlinefs, aukwardnefs, and indecency, are fhrewd fymptoms of fomething mean, carelefs, and deficient, and betray a mind untaught, illiberal, unconfcious of what is due to one's felf or to others. How much cleanlinefs conduces to health needs hardly to be mentioned; and how neceffary it is to maintain one's character and rank in life, and to render us agreeable to others as well as to ourfelves, is as evident.—There are certain motions, airs and geftures, which become the human countenance and form, in which we perceive a comelinefs, opennefs, fimplicity, gracefulnefs; and there are others, which, to our fenfe of decorum, appear uncomely, affected, difingenuous, and aukward, quite unfuitable to the native dignity of our face and form. The firft are in themfelves the moft eafy, natural, and commodious; give one boldnefs and prefence of mind, a modeft affurance, an adrefs both awful and alluring, they befpeak candour and greatnefs of mind, raife the moft agreeable prejudices in one's favour, render fociety engaging, command refpect, and often love, and give weight and authority both in converfation and bufinefs: in fine, they are the colouring of virtue, which fhew it to the greateft advantage in whomfoever it is; and not only imitate, but in fome meafure fupply it where it is wanting. Whereas the laft, *viz.* rudenefs, affectation, indecorum, and the like, have all the contrary effects; they are burdenfome to one's felf, a difhonour to our nature and a nuifance in fociety. The former qualities or goods are beft attained by a liberal education, by preferving a juft fenfe of the dignity of our nature, by keeping the beft and politeft company; but above all, by acquiring thofe virtuous and ennobling habits of mind, which are decency in perfection, which will give an air of unaffected grandeur, and fpread a luftre truly engaging over the whole form and deportment.

We are next to confider thofe goods which confift in exterior focial connections; as fame, fortune, civil authority, power.

The firft has a twofold afpect; as a good pleafant in itfelf, or gratifying to an original paffion; and then, as expedient or ufeful towards a farther end. Honour from the wife and good, on the account of a virtuous conduct, is regaling to a good man. There are few quite indifferent

even

even to the commendation of the vulgar. Though we cannot approve that conduct which proceeds entirely from this principle, and not from good affection or love of the conduct itſelf; yet as it is often a guard and additional motive to virtue in creatures imperfect as we are, and often diſtracted by interfering paſſions, it might be dangerous to ſuppreſs it altogether, however wiſe it may be to reſtrain it within due bounds, and however laudable to uſe it only as a ſcaffolding to our virtue, which may be taken down when that glorious ſtructure is finiſhed, but hardly till then. To purſue fame for itſelf, is innocent; to regard it only as an auxiliary to virtue, is noble; to ſeek it chiefly as an engine of public uſefulneſs, is ſtill more noble. For though the opinion and breath of men are tranſient and fading things; often obtained without merit, and loſt without cauſe: yet as our buſineſs is with men, and as our capacity of ſerving them is generally increaſed in proportion to their eſteem of us; therefore ſound and well eſtabliſhed moral applauſe may, and will be, modeſtly, not oſtentatiouſly, ſought after by the good; not indeed as a ſolitary refined ſort of luxury, but as a public and proper inſtrument to ſerve and bleſs mankind. At the ſame time they will learn to deſpiſe that reputation which is founded on rank, fortune, and any other circumſtances or accompliſhments that are foreign to real merit, or to uſeful ſervices done to others; and think that praiſe of little avail which is purchaſed without deſert, and beſtowed without judgment.

Fortune, power, and civil authority, or whatever is called influence and weight among mankind, are goods of the ſecond diviſion; that is, valuable and purſuable only as they are uſeful, or as means to a farther end, *viz.* the procuring or preſerving the immediate objects of enjoyment or happineſs to ourſelves or others. Therefore, to love ſuch goods on their own account, and to purſue them as ends, not the means of enjoyment, muſt be highly prepoſterous and abſurd. There can be no meaſure, no limit to ſuch purſuit; all muſt be whim, caprice, extravagance. Accordingly, ſuch appetites, unlike all the natural ones, are increaſed by poſſeſſion, and whetted by enjoyment. They are always precarious, and never without fears becauſe the objects lie without one's ſelf; they are ſeldom without ſorrow and vexation, becauſe no acceſſion of wealth or power can ſatisfy them. But if thoſe goods are conſidered only as the materials or means of private or public happineſs; then the ſame obligations which bind us to purſue the latter, bind us likewiſe to purſue the former. We may, and no doubt we ought, to ſeek ſuch a meaſure of wealth as is neceſſary to ſupply all our real wants, to raiſe us above ſervile dependence, and provide us with ſuch conveniencies as are ſuited to our rank and condition in life. To be regardleſs of this meaſure of wealth is to expoſe ourſelves to all the temptations of poverty and corruption; to forfeit our natural independency and freedom; to degrade, and conſequently to render the rank we hold, and the character we ſuſtain in ſociety, uſeleſs, if not contemptible. When theſe important ends are ſecured, we ought not to murmur or repine that we poſſeſs no more; yet we are not ſecluded by any obligation, moral or divine, from ſeeking more, in order to give us that happieſt and moſt God-like of all powers, the power of doing good. A ſupine indolence in this reſpect is both abſurd and criminal; abſurd, as it robs us of an inexhauſted fund of the moſt refined and durable enjoyments; and criminal, as it renders us ſo far uſeleſs to the ſociety to which we belong. "That purſuit of wealth which goes beyond the former end, *viz.* the obtaining the neceſſaries, or ſuch convenienees of life, as in the eſtimation of reaſon, not of vanity or paſſion, are ſuited to our rank and condition, and yet is not directed to the latter, *viz.* the doing good, is what we call avarice." And "that purſuit of power, which, after ſecuring one's ſelf, *i. e.* attaining the proper independence and liberty of a rational ſocial creature, is not directed to the good of others, is what we call ambition, or the luſt of power." To what extent the ſtrict meaſures of virtue will allow us to purſue either wealth, or power, and civil authority, is not perhaps poſſible preciſely to determine. That muſt be left to prudence, and the peculiar character, condition, and other circumſtances of each man. Only thus far a limit may be ſet, that the purſuit of either muſt encroach upon no other duty or obligation which we owe to ourſelves, to ſociety, or to its Parent and Head. The ſame reaſoning is to be applied to power as to wealth. It is only valuable as an inſtrument of our own ſecurity, and of the free enjoyment of thoſe original goods it may, and often does, adminiſter to us; and as an engine of more extenſive happineſs to our friends, our country, and mankind.

Now the beſt, and indeed the only way to obtain a ſolid and laſting fame, is an uniform inflexible courſe of virtue, the employing one's ability and wealth in ſupplying the wants, and uſing one's power in promoting or ſecuring the happineſs, the rights and liberties of mankind, joined to an univerſal affability and politeneſs of manners. And ſurely one will not miſtake the matter much, who thinks the ſame courſe conducive to the acquiring greater acceſſions both of wealth and power: eſpecially if he adds to thoſe qualifications a vigorous induſtry, a conſtant attention to the characters and wants of men, to the conjunctures of times, and continually varying genius of affairs; and a ſteddy intrepid honeſty, that will neither yield to the allurements, nor be overawed with the terrors of that corrupt and corrupting ſcene in which we live. We have ſometimes heard, indeed, of other ways and means, as fraud, diſſimulation, ſervility, and proſtitution, and the like ignoble arts, by which the men of the world (as they are called, ſhrewd politicians, and men of addreſs!) amaſs wealth, and procure power: but as we want rather to form a man of virtue, an honeſt, contented, happy man, we leave to the men of the world their own ways, and permit them unenvied, and unimitated by us, to reap the fruit of their doings.

The next ſpecies of objects in the ſcale of good, are the goods of the intellect; as knowledge, memory, judgement, taſte, ſagacity, docility, and whatever elſe we call intellectual virtues. Let us conſider them a little, and the means as well as obligations to improve them.

As man is a rational creature, capable of knowing the differences of things and actions;—as he not only ſees and feels what is preſent, but remembers what is paſt, and often foreſees what is future;—as he advances, from ſmall

beginnings

beginnings, by ſlow degrees, and with much labour and difficulty to knowledge and experience ;—as his opinions ſway his paſſions;—as his paſſions influence his conduct,—and as his conduct draws conſequences after it, which extend not only to the preſent, but to the future time, and therefore is the principal ſource of his happineſs or miſery;—it is evident, that he is formed for intellectual improvements, and that it muſt be of the utmoſt conſequence for him to improve and cultivate his intellectual powers, on which thoſe opinions, thoſe paſſions, and that conduct depend.

But beſides the future conſequences and moment of improving our intellectual powers, their immediate exerciſe on their proper objects yields the moſt rational and refined pleaſures. Knowledge and a right taſte in the arts of imitation and deſign, as poetry, painting, ſculpture, muſic, architecture, afford not only an innocent, but a moſt ſenſible and ſublime entertainment. By theſe the underſtanding is inſtructed in ancient and modern life, the hiſtory of men and things, the energies and effects of the paſſions, the conſequences of virtue and vice ; by theſe the imagination is at once entertained and nouriſhed with the beauties of nature and art, lighted up and ſpread out with the novelty, grandeur, and harmony of the univerſe ; and in fine, the paſſions are agreeably rouzed, and ſuitably engaged by the greateſt and moſt intereſting objects that can fill the human mind. He who has a taſte formed to theſe ingenious delights, and plenty of materials to gratify it, can never want the moſt agreeable exerciſe and entertainment, nor once have reaſon to make that faſhionable complaint of the tedioufneſs of time. Nor can he want a proper ſubject for the diſcipline and improvement of his heart. For being daily converſant with beauty, order and deſign, in inferior ſubjects, he bids fair for growing in due time an admirer of what is fair and well-proportioned in the conduct of life, and the order of ſociety, which is only order and deſign exerted in their higheſt ſubject. He will learn to transfer the numbers of poetry to the harmony of the mind, and of well-governed paſſions ; and from admiring the vritues of others in moral paintings, come to approve and imitate them himſelf. Therefore to cultivate a true and correct taſte, muſt be both our intereſt and our duty, when the circumſtances of our ſtation give leiſure and opportunity for it, and when the doing it is not inconſiſtent with our higher obligations or engagements to ſociety and mankind.

It is beſt attained by reading the beſt books, where good ſenſe has more the aſcendant than learning, and which retain more to practice than to ſpeculation ; by ſtudying the beſt models, *i. e.* thoſe which profeſs to imitate nature moſt, and approach the neareſt to it ; and by converſing with men of the moſt refined taſte, and the greateſt experience in life.

As to the other intellectual goods, what a fund of entertainment muſt it be to inveſtigate the truth and various relations of things ; to trace the operations of nature to general laws ; to explain by theſe its manifold phænomena ; to underſtand that order by which the univerſe is upheld, and that œconomy by which it is governed ; to be acquainted with the human mind, the connection, ſubordinations, and uſes of its powers, and to mark their energy in life ! How agreeable to the ingenious inquirer, to obſerve the manifold relations and combinations of individual minds in ſociety ; to diſcern the cauſes why they flouriſh or decay ; and from thence to aſcend, through the vaſt ſcale of beings, to that General Mind which preſides over all, and operates unſeen in every ſyſtem, and in every age, through the whole compaſs and progreſſion of nature ! Devoted to ſuch entertainments as theſe, the contemplative have abandoned every other pleaſure, and ſequeſtered themſelves from ſocial intercourſe ; for theſe the buſy have often preferred, to the hurry and din of life, the calm retreats of contemplation ; for theſe, when once they came to taſte them, even the gay and voluptuous have thrown up the lawleſs purſuits of ſenſe and appetite, and acknowledged theſe mental enjoyments to be the moſt refined, and indeed the only luxury. Beſides, by a juſt and large knowledge of nature, we recognize the perfections of its Author ; and thus piety, and all thoſe pious affections which depend on juſt ſentiments of his character, are awakened and confirmed ; and a thouſand ſuperſtitious fears, that ariſe from partial views of his nature and works, will of courſe be excluded. An extenſive proſpect of human life, and of the periods and revolutions of human things, will conduce much to the giving a certain greatneſs of mind, and a noble cotempt of thoſe little competitions about power, honour, and wealth, which diſturb and divide the bulk of mankind ; and promote a calm indurance of thoſe inconveniencies and ills that are the common appendages of humanity. Add to all, that a juſt knowledge of human nature, and of thoſe hinges upon which the buſineſs and fortunes of men turn, will prevent our thinking either too highly, or too meanly of our fellow-creatures ; give no ſmall ſcope to the exerciſe of friendſhip, confidence, and good-will ; and, at the ſame time, brace the mind with a proper caution and diſtruſt, and give a greater maſtery in the conduct of private as well as public life. Therefore, by cultivating our intellectual abilities, we ſhall beſt promote and ſecure our intereſt, and be qualified for acting our part in ſociety with more honour to ourſelves, as well as advantage to mankind. Conſequently, to improve them to the utmoſt of our power is our duty ; they are talents committed to us by the Almighty Head of ſociety, and we are accountable to him for the uſe of them.

The intellectual virtues are beſt improved by accurate and impartial obſervation, extenſive reading, and unconfined converſe with men of all characters, eſpecially with thoſe who, to private ſtudy, have joined the wideſt acquaintance with the world and greateſt practice in its affairs ; but above all, by being much in the world, and having large dealings with mankind. Such opportunities contribute much to diveſt one of prejudices and a ſervile attachment to crude ſyſtems, to open one's views, and to give that experience on which the moſt uſeful knowledge is built, and from which the ſureſt maxims for the conduct of life are deduced.

The higheſt goods which enter into the compoſition of human happineſs are moral goods of the mind, directly and ultimately regarding ourſelves ; as command of the appetites and paſſions, prudence and caution, magnanimity, fortitude,

fortitude, humility, love of virtue, love of God, resignation, and the like. These sublime goods are, by way of eminence, goods recommended and enforced by the most intimate and awful sense and consciousness of our nature; goods that constitute the quintessence of happiness, that form and complection of soul which renders us approveable and lovely in the sight of God; goods, in fine, which are the elements of all our future perfection and felicity.

Most of the other goods we have considered depend partly on ourselves, and partly on accidents which we can neither foresee nor prevent, and result from causes which we cannot influence or alter. They are such goods as we may possess to-day and lose to-morrow, and which require a felicity of constitution and talents to attain them in full vigour and perfection, and a felicity of conjunctures to secure the possession of them. Therefore, did our happiness depend altogether or chiefly on such transitory and precarious possessions, it were itself most precarious, and the highest folly to be anxious about it.—But though creatures, constituted as we are, cannot be indifferent about such goods, and must suffer in some degree, and consequently have our happiness incomplete without them, yet they weigh but little in the scale when compared with moral goods. By the benevolent constitution of our nature, these are placed within the sphere of our activity, so that no man can be destitute of them unless he is first wanting to himself. Some of the wisest and best of mankind have wanted most of the former goods, and all the external kind, and felt most of the opposite ills; yet, by possessing the latter, have declared they were happy, and to the conviction of the most impartial observers have appeared happy. The worst of men have been surrounded with every outward good and advantage of fortune, and have possessed great parts; yet, for want of moral rectitude, have been notoriously and exquisitely miserable. The exercise of virtue has supported its votaries, and made them exult in the midst of tortures almost intolerable; nay, how often has some false form or shadow of it sustained even the greatest villains and bigots under the same pressures! But no external goods, no goods of fortune, have been able to alleviate the agonies, or expel the fears of a guilty mind, conscious of the deserved hatred and reproach of mankind, and the just displeasure of almighty God.

As the present condition of human life is wonderfully chequered with good and ill; and as no height of station, no affluence of fortune, can absolutely insure the good or secure against the ill; it is evident, that a great part of the comfort and serenity of life must lie in having our minds duly affected with regard to both, *i e.* rightly attempered to the loss of one and the sufferance of the other. For it is certain, that outward calamities derive their chief malignity and pressure from the inward dispositions with which we receive them. By managing these right, we may greatly abate that malignity and pressure, and consequently diminish the number and weaken the moment of the ills of life, if we should not have it in our power to obtain a large share of its goods. There are particularly three virtues which go to the forming this right temper towards ill, and which are of singular efficacy, if not totally to remove, yet wonderfully to alleviate the calamities of life. These are fortitude, or patience, humility, and resignation.

Fortitude is that calm and steddy habit of mind, which either moderates our fears, and enables us bravely to encounter the prospect of ill, or renders the mind serene and invincible under its immediate pressure. It lies equally distant from rashness and cowardice; and though it does not hinder us from feeling, yet prevents our complaining or shrinking under the stroke. It always includes a generous contempt of, or at least a noble superiority to, those precarious goods of which we can insure neither the possession nor continuance. The man therefore who possesses this virtue in this ample sense of it, stands upon an eminence, and sees human things below him; the tempest indeed may reach him, but he stands secure and collected against it upon the basis of conscious virtue, which the severest storms can seldom shake, and never overthrow.

Humility is another virtue of high rank and dignity, though often mistaken by proud mortals for meanness and pusillanimity. It is opposed to pride, which commonly includes in it a false or over-rated estimation of our own merit, an ascription of it to ourselves as its only and original cause, an undue comparison of ourselves with others, and, in consequence of that supposed superiority, an arrogant preference of ourselves, and a supercilious contempt of them. Humility, on the other hand, seems to denote that modest and ingenuous temper of mind, which arises from a just and equal estimate of our own advantages compared with those of others, and from a sense of our deriving all originally from the Author of our being. Its ordinary attendants are mildness, a gentle forbearance, and an easy unassuming humanity with regard to the imperfections and faults of others; virtues rare indeed, but of the fairest complection, the proper offspring of so lovely a parent, the best ornaments of such imperfect creatures as we are, precious in the sight of God, and which sweetly allure the hearts of men.

Resignation is that mild and heroic temper of mind, which arises from a sense of an infinitely wise and good providence, and enables one to acquiesce with a cordial affection in its just appointments. This virtue has something very peculiar in its nature, and sublime in its efficacy. For it teaches us to bear ill, not only with patience, and as being unavoidable; but it transforms, as it were, ill into good, by leading us to consider it, and every thing that has the least appearance of ill, as a divine dispensation, a wise and benevolent temperament of things, subservient to universal good, and of course including that of every individual, especially of such as calmly stoop to it. In this light, the administration itself, nay, every act of it, becomes an object of affection; the evil disappears, or is converted into a balm which both heals and nourishes the mind. For, though the first unexpected access of ill may surprise the soul into grief; yet that grief, when the mind calmly reviews its object, changes into contentment, and is by degrees exalted into veneration and a divine composure. Our private will is lost in that of the Almighty, and our security against every real ill rests on the same bottom as the throne of Him who lives and reigns for ever.

Before we finiſh this ſection, it may be fit to obſerve, that as the Deity is the ſupreme and inexhauſted ſource of good, on whom the happineſs of the whole creation depends; as he is the higheſt object in nature, and the only object who is fully proportioned to the intellectual and moral powers of the mind, in whom they ultimately reſt and find their moſt perfect exerciſe and completion; he is therefore termed the *chief good* of man *objectively* conſidered: And virtue, or the proportioned and vigorous exerciſe of the ſeveral powers and affections on their reſpective objects, as above deſcribed, is, in the ſchools, termed the *chief good formally* conſidered, or its *formal* idea, being the inward temper and native conſtitution of human happineſs.

From the detail we have gone through, the following corollaries may be deduced.

1. It is evident that the happineſs of ſuch a progregreſſive creature as man can never be at a ſtand, or continue a fixed invariable thing. His finite nature, let it riſe ever ſo high, admits ſtill higher degrees of improvement and perfection: and his progreſſion in improvement, or virtue, always makes way for a progreſſion in happineſs. So that no poſſible point can be aſſigned in any period of his exiſtence in which he is perfectly happy, that is, ſo happy as to exclude higher degrees of happineſs. All his perfection is only comparative. 2. It appears that many things muſt conſpire to complete the happineſs of ſo various a creature as man, ſubject to ſo many wants, and ſuſceptible of ſuch different pleaſures. 3. As his capacities of pleaſure cannot be all gratified at the ſame time, and muſt often interfere with each other in ſuch a precarious and fleeting ſtate as human life, or be frequently diſappointed, perfect happineſs, *i. e.* the undiſturbed enjoyment of the ſeveral pleaſures of which we are capable, is unattainable in our preſent ſtate. 4. That ſtate is moſt to be ſought after, in which the feweſt competitions and diſappointments can happen, which leaſt of all impairs any ſenſe of pleaſure, and opens an inexhauſted ſource of the moſt refined and laſting enjoyments. 5. That ſtate which is attended with all thoſe advantages is a ſtate or courſe of virtue. 6. Therefore, a ſtate of virtue, in which the moral goods of the mind are attained, is the happieſt ſtate.

Duties *to* Society.

Filial and Fraternal duty.

As we have followed the order of nature in tracing the hiſtory of man, and thoſe duties which he owes to himſelf; it ſeems reaſonable to take the ſame method with thoſe he owes to ſociety, which conſtitute the ſecond claſs of his obligations.

His parents are among the earlieſt objects of his attention; he becomes ſooneſt acquainted with them, repoſes a peculiar confidence in them, and ſeems to regard them with a fond affection, the early prognoſtics of his future piety and gratitude. Thus does nature dictate the firſt lines of filial duty, even before a juſt ſenſe of the connection is formed. But when the child is grown up, and has attained to ſuch a degree of underſtanding as to comprehend the moral tie, and be ſenſible of the obligations he is under to his parents; when he looks back on their tender and diſintereſted affection, their inceſſant cares and labours in nurſing, educating and providing for him during that ſtate in which he had neither prudence nor ſtrength to care and provide for himſelf; he muſt be conſcious that he owes to them theſe peculiar duties.

1. To reverence and honour them as the inſtruments of nature in introducing him to life, and to that ſtate of comfort and happineſs which he enjoys; and therefore to eſteem and imitate their good qualities, to alleviate and bear with, and ſpread as much as poſſible a decent veil over their faults and weakneſſes.

2. To be highly grateful to them for thoſe favours which it can hardly ever be in his power fully to repay; to ſhew this gratitude by a ſtrict attention to their wants, and a ſolicitous care to ſupply them; by a ſubmiſſive deference to their authority and advice; by yielding to, rather than peeviſhly contending with their humours, as remembering how oft they have been perſecuted by his; and in fine, by ſoothing their cares, lightening their ſorrows, ſupporting the infirmities of age, and making the remainder of their life as comfortable and joyful as poſſible.

As his brethren and ſiſters are the next with whom the creature forms a ſocial and moral connection, to them he owes a fraternal regard; and with them ought he to enter into a ſtrict league of friendſhip, mutual ſympathy, advice, aſſiſtance, and a generous intercourſe of kind offices, remembering their relation to common parents, and that brotherhood of nature which unites them into a cloſer community of intereſt and affection.

Concerning Marriage.

When man arrives to a certain age, he becomes ſenſible of a peculiar ſympathy and tenderneſs towards the other ſex; the charms of beauty engage his attention, and call forth new and ſofter diſpoſitions than he has yet felt. The many amiable qualities exhibited by a fair outſide, or by the mild allurement of female manners, or which the prejudiced ſpectator without much reaſoning ſuppoſes thoſe to include, with ſeveral other circumſtances, point his view and affection to a particular object, and of courſe contract that general rambling regard, which was loſt and uſeleſs among the undiſtinguiſhed croud, into a peculiar and permanent attachment to one woman, which ordinarily terminates in the moſt important, venerable, and delightful connection in life.

The ſtate of the brute-creation is very different from that of human creatures. The former are cloathed and generally armed by their ſtructure, eaſily find what is neceſſary to their ſubſiſtence, and ſoon attain their vigour and maturity; ſo that they need the care and aid of their parents but for a ſhort while; and therefore we ſee that nature has aſſigned to them vagrant and tranſient amours. The connection being purely natural, and formed merely for propagating and rearing their offspring; no ſooner is that end anſwered, than the connection diſſolves of courſe. But the human race are of a more tender and defenceleſs conſtitution; their infancy and non-age continue longer; they advance ſlowly to ſtrength of body, and maturity of reaſon; they need conſtant attention, and a long ſeries of cares

cares and labours to train them up to decency, virtue, and the various arts of life. Nature has, therefore, provided them with the most affectionate and anxious tutors, to aid their weakness, to supply their wants, and to accomplish them in those necessary arts;—even their own parents, on whom she has devolved this mighty charge, rendered agreeable by the most alluring and powerful of all ties, parental affection. But unless both concur in this grateful task, and continue their joint labours, till they have reared up and planted out their young colony, it must become a prey to every rude invader, and the purpose of nature in the original union of the human pair be defeated. Therefore our structure as well as condition is an evident indication, that the human sexes are destined for a more intimate, for a moral and lasting union. It appears likewise, that the principal end of marriage is not to propagate and nurse up an offspring, but to educate and form minds for the great duties and extensive destinations of life. Society must be supplied from this original nursery with useful members, and its fairest ornaments and supports.

The mind is apt to be dissipated in its views, and acts of friendship and humanity; unless the former be directed to a particular object, and the latter employed in a particular province. When men once indulge to this dissipation, there is no stopping their career; they grow insensible to moral attractions, and, by obstructing or impairing the decent and regular exercise of the tender and generous feelings of the human heart, they in time become unqualified for, or averse to, the forming a moral union of souls, which is the cement of society, and the source of the purest domestic joys. Whereas a rational undepraved love, and its fair companion marriage, collect a man's views, guide his heart to its proper object, and by confining his affection to that object do really enlarge its influence and use. Besides, it is but too evident from the conduct of mankind, that the common ties of humanity are too feeble to engage and interest the passions of the generality in the affairs of society. The connections of neighbourhood, acquaintance, and general intercourse, are too wide a field of action for many; and those of a public or community are so for more, and in which they either care not or know not how to exert themselves. Therefore nature, ever wise and benevolent, by implanting that strong sympathy which reigns between the individuals of each sex, and by urging them to form a particular moral connection, the spring of many domestic endearments, has measured out to each pair a particular sphere of action, proportioned to their views, and adapted to their respective capacities. Besides, by interesting them deeply in the concerns of their own little circle, she has connected them more closely with society, which is composed of particular families, and bound them down to their good behaviour in that particular community to which they belong. This moral connection is marriage, and this sphere of action is a family.

Of the conjugal alliance the following are the natural laws. 1. Mutual fidelity to the marriage-bed. Disloyalty defeats the very end of marriage; dissolves the natural cement of the relation; weakens the moral tie, the chief strength of which lies in the reciprocation of affection; and, by making the offspring uncertain, diminishes the care and attachment necessary to their education.

2. A conspiration of counsels and endeavours to promote the common interest of the family, and to educate their common offspring. In order to observe these laws, it is necessary to cultivate, both before and during the married state, the strictest decency and chastity of manners, and a just sense of what becomes their respective characters.

3. The union must be inviolable and for life. The nature of friendship, and particularly of this species of it, the education of their offspring, and the order of society, and of successions which would otherwise be extremely perplexed, do all seem to require it. To preserve this union, and render the matrimonial state more harmonious and comfortable, a mutual esteem and tenderness, a mutual deference and forbearance, a communication of advice, and assistance and authority, are absolutely necessary. If either party keep within their proper departments, there need be no disputes about power or superiority, and there will be none. They have no opposite, no separate interests; and therefore there can be no just ground for opposition of conduct.

From this detail, and the present state of things, in which there is pretty near a parity of numbers of both sexes, it is evident, that polygamy is an unnatural state: and though it should be granted to be more fruitful of children, which however it is not found to be; yet it is by no means so fit for rearing minds; which seems to be as much, if not more, the intention of nature, than the propagation of bodies.

Of Parental Duty.

The connection of parents with their children is a natural consequence of the matrimonial connection, and the duties which they owe them result as naturally from that connection. The feeble state of children, subject to so many wants and dangers, requires their incessant care and attention; their ignorant and uncultivated minds demand their continual instruction and culture. Had human creatures come into the world with the full strength of men, and the weakness of reason and vehemence of passions which prevail in children, they would have been too strong or too stubborn to have submitted to the government and instruction of their parents. But, as they were designed for a progression in knowledge and virtue, it was proper that the growth of their bodies should keep pace with that of their minds, lest the purposes of that progression should have been defeated. Among other admirable purposes which this gradual expansion of their outward as well as inward structure serves, this is one, that it affords ample scope to the exercise of many tender and generous affections, which fill up the domestic life with a beautiful variety of duties and enjoyments; and are of course a noble discipline for the heart, and an hardy kind of education for the more honourable and important duties of public life.

The above-mentioned weak and ignorant state of children, seems plainly to invest their parents with such authority

thority and power as is necessary to their support, protection, and education: but that authority and power can be construed to extend no farther than is necessary to answer those ends, and to last no longer than that weakness and ignorance continue; wherefore, the foundation or reason of the authority and power ceasing, they cease of course. Whatever power or authority, then, it may be necessary or lawful for parents to exercise during the non-age of their children, to assume or usurp the same when they have attained the maturity or full exercise of their strength and reason, would be tyrannical and unjust. From hence it is evident, that parents have no right to punish the persons of their children more severely than the nature of their wardship requires; much less to invade their lives, to encroach upon their liberty, or transfer them as their property to any master whatsoever.

The first class of duties which parents owe their children respect their natural life; and these comprehend protection, nurture, provision, introducing them into the world in a manner suitable to their rank and fortune, and the like.

The second order of duties regards the intellectual and moral life of their children, or their education in such arts and accomplishments as are necessary to qualify them for performing the duties they owe to themselves and to others. As this was found to be the principal design of the matrimonial alliance, so the fulfilling that design is the most important and dignified of all the parental duties. In order therefore to fit the child for acting his part wisely and worthily, as a man, as a citizen, and a creature of God, both parents ought to combine their joint wisdom, authority, and power, and each apart to employ those talents which are the peculiar excellency and ornament of their respective sex. The father ought to lay out and superintend their education; the mother to execute and manage the detail of which she is capable. The former should direct the manly exertion of the intellectual and moral powers of his child. His imagination, and the manner of those exertions, are the peculiar province of the latter. The former should advise, protect, command, and by his experience, masculine vigour, and that superior authority which is commonly ascribed to his sex, brace and strengthen his pupil for active life, for gravity, integrity, and firmness in suffering. The business of the latter is to bend and soften her male pupil, by the charms of her conversation, and the softness and decency of her manners, for social life, for politeness of taste, and the elegant decorums of and enjoyments of humanity; and to improve and refine the tenderness and modesty of her female pupil, and form her to all those mild domestic virtues, which are the peculiar characteristics and ornaments of her sex.

To conduct the opening minds of their sweet charge through the several periods of their progress; to assist them in each period in throwing out the latent seeds of reason and ingenuity, and in gaining fresh accessions of light and virtue; and at length, with all these advantages, to produce the young adventurers upon the great theatre of human life, to play their several parts in the sight of their friends, of society, and mankind.

Herile and Servile Duty.

In the natural course of human affairs it must necessarily happen, that some of mankind will live in plenty and opulence, and others be reduced to a state of indigence and poverty. The former need the labours of the latter, and the latter the provision and support of the former. This mutual necessity is the foundation of that connection, whether we call it moral or civil, which subsists between masters and servants. He who feeds another has a right to some equivalent, the labour of him whom he maintains, and the fruits of it. And he who labours for another has a right to expect that he should support him. But as the labours of a man of ordinary strength are certainly of greater value than mere food and cloathing; because they would actually produce more, even the maintenance of a family, were the labourer to employ them in his own behalf; therefore he has an undoubted right to rate and dispose of his service for certain wages above mere maintenance; and if he has incautiously disposed of it for the latter only, yet the contract being of the onerous kind, he may equitably claim a supply of that deficiency. If the service be specified, the servant is bound to that only; if not, then he is to be construed as bound only to such services as are consistent with the laws of justice and humanity. By the voluntary servitude to which he subjects himself, he forfeits no rights but such as are necessarily included in that servitude, and is obnoxious to no punishment but such as a voluntary failure in the service may be supposed reasonably to require. The offspring of such servants have a right to that liberty which neither they nor their parents have forfeited.

As to those who, because of some heinous offence, or for some notorious damage, for which they cannot otherwise compensate, are condemned to perpetual service; they do not, on that account, forfeit all the rights of men; but those, the loss of which is necessary to secure society against the like offences for the future, or to repair the damage they have done.

With regard to captives taken in war, it is barbarous and inhuman to make perpetual slaves of them, unless some peculiar and aggravated circumstances of guilt have attended their hostility. The bulk of the subjects of any government engaged in war, may be fairly esteemed innocent enemies; and therefore they have a right to that clemency which is consistent with the common safety of mankind, and the particular security of that society against which they are engaged. Though ordinary captives have a grant of their lives; yet to pay their liberty as an equivalent, is much too high a price. There are other ways of acknowledging or returning the favour, than by surrendering what is far dearer than life itself. To those who, under pretext of the necessities of commerce, drive the unnatural trade of bargaining for human flesh, and consigning their innocent but unfortunate fellow-creatures to eternal servitude and misery, we may address the words of a fine writer; "Let avarice defend it as it will, there is an honest reluctance in humanity against buying and selling and regarding those of our own species as our wealth and possessions."

Social

Social Duties of the private Kind.

Hitherto we have confidered only the domeftic oeconomical duties, becaufe thefe are firft in the progrefs of nature. But as man paffes beyond the little circle of a family, he forms connections with relations, friends, neighbours, and others; from whence refults a new train of duties of the more private focial kind, as friendfhip, chaftity, courtefy, good-neighbourhood, charity, forgivenefs, hofpitality.

Man is admirably formed for particular focial attachments and duties. There is a peculiar and ftrong propenfity in his nature to be affected with the fentiments and difpofitions of others. Men, like certain mufical inftruments, are fet to each other, fo that the vibrations or notes excited in one raife correfpondent notes and vibrations in the others. The impulfes of pleafure or pain, joy or forrow, made on one mind, are, by an inftantaneous fympathy of nature, communicated in fome degree to all; efpecially when hearts are in unifon of kindnefs; the joy that vibrates in one, communicates to the other alfo. We may add, that though joy thus imparted fwells the harmony; yet grief vibrated to the heart of a friend, and rebounding from thence in fympathetic notes, melts, as it were, and almoft dies away. All the paffions, but efpecially thofe of the focial kind, are contagious; and when the paffions of one man mingle with thofe of another, they increafe and multiply prodigioufly. There is a moft moving eloquence in the human countenance, air, voice, and gefture, wonderfully expreffive of the moft latent feelings and paffions of the foul, which darts them, like a fubtle flame, into the hearts of others, and raifes correfpondent feelings there: friendfhip, love, good-humour, joy, fpread through every feature, and particularly fhoot from the eyes their fofter and fiercer fires with an irrefiftible energy. And in like manner, the oppofite paffions of hatred, enmity, ill humour, melancholy, diffufe a fullen and faddening air over the face, and, flafhing from eye to eye, kindle a train of fimilar paffions. By thefe and other admirable pieces of machinery, men are formed for fociety and the delightful interchange of friendly fentiment and duties; to increafe the happinefs of others by participation, and their own by rebound; and to diminifh, by dividing, the common ftock of their mifery.

The firft emanations of the focial principle beyond the bounds of a family, lead us to form a nearer conjunction of friendfhip or goodwill with thofe who are anywife connected with us by blood or domeftic alliance. To them our affection does, commonly, exert itfelf in a greater or lefs degree, according to the nearnefs or diftance of the relation. And this proportion is admirably fuited to the extent of our powers and the indigence of our ftate; for it is only within thofe leffer circles of confanguinity or alliance, that the generality of mankind are able to difplay their abilities or benevolence, and confequently to uphold their connection with fociety and fubferviency to a public intereft. Therefore it is our duty to regard thefe clofer connections as the next department to that of a family, in which nature has marked out for us a fphere of activity and ufefulnefs; and to cultivate the kind affections which are the cement of thofe endearing alliances.

Frequently, the view of diftinguifhing moral qualities in fome of our acquaintance may give birth to that more noble connection we call friendfhip, which is far fuperior to the alliances of confanguinity. For thefe are of a fuperficial, and often of a tranfitory nature; of which, as they hold more of inftinct than of reafon, we cannot give fuch a rational account. But friendfhip derives all its ftrength and beauty, and the only exiftence which is durable, from the qualities of the heart, or from virtuous and lovely difpofitions. Therefore friendfhip may be defcribed to be, "The union of two fouls, by means of virtue, the common object and cement of their mutual affection." Without virtue, or the fuppofition of it, friendfhip is only a mercenary league, an alliance of intereft, which muft diffolve of courfe when that intereft decays or fubfifts no longer. It is not fo much any particular paffion, as a compofition of fome of the nobleft feelings and paffions of the mind. Good fenfe, a juft tafte and love of virtue, a thorough candor and benignity of heart, or what we ufually call a good temper, and a generous fympathy of fentiments and affections, are the neceffary ingredients of this virtuous connection. When it is grafted on efteem, ftrengthened by habit, and mellowed by time, it yields infinite pleafure ever new and ever growing, is a noble fupport amidft the various trials and viciffitudes of life, and an high feafoning to moft of our other enjoyments. To form and cultivate virtuous friendfhip muft be very improving to the temper; as its principal object is virtue, fet off with all the allurement of countenance, air, and manners, fhining forth in the native graces of manly honeft fentiments and affections, and rendered vifible as it were to the friendly fpectator in a conduct unaffectedly great and good; and as its principal exercifes are the very energies of virtue, or its effects and emanations. So that, where-ever this amiable attachment prevails, it will exalt our admiration and attachment to virtue, and, unlefs impeded in its courfe by unnatural prejudices, run out into a friendfhip to the human race. For as no one can merit, and none ought to ufurp, the facred name of friend, who hates mankind; fo, whoever truly loves them, poffeffes the moft effential quality of a true friend.

The duties of friendfhip are, a mutual efteem of each other, unbribed by intereft, and independent of it; a generous confidence, as far diftant from fufpicion as from referve; an inviolable harmony of fentiments and difpofitions, of defigns and interefts; a fidelity unfhaken by the changes of fortune; a conftancy unalterable by diftance of time or place; a refignation of one's perfonal interefts to thofe of one's friend; and a reciprocal, unenvious, unreferved exchange of kind offices.—But amidft all the exertions of this moral connection, humane and generous as it is, we muft remember that it operates within a narrow fphere, and its immediate operations refpect only the individual; and therefore particular impulfes muft ftill be fubordinate to a more public intereft, or be always directed and controuled by the more extenfive connections of our nature.

When our friendfhip terminates on any of the other

ſex, in whom beauty or agreeableneſs of perſon and external gracefulneſs of manners conſpire to expreſs and heighten the moral charm of a tender honeſt heart, and ſweet, ingenuous, modeſt temper, lighted up by good ſenſe, it generally grows into a more ſoft and endearing attachment. When this attachment is improved by a growing acquaintance with the worth of its object, is conducted by diſcretion, and iſſues at length, as it ought to do, in the moral connection of marriage, it becomes the ſource of many amiable duties, of a communication of paſſions and intereſts, of the moſt refined decencies, and of a thouſand nameleſs deep-felt joys of reciprocal tenderneſs and love, flowing from every look, word, and action. Here friendſhip acts with double energy, and the natural conſpires with the moral charm to ſtrengthen and ſecure the love of virtue. As the delicate nature of female honour and decorum, and the inexpreſſible grace of a chaſte and modeſt behaviour, are the ſureſt and indeed the only means of kindling at firſt, and ever after of keeping alive this tender and elegant flame, and of accompliſhing the excellent ends deſigned by it; to attempt by fraud to violate one, or, under pretence of paſſion, ſully and corrupt the other, and, by ſo doing, to expoſe the too often credulous and unguarded object, with a wanton cruelty, to the hatred of her own ſex, and the ſcorn of ours, and to the loweſt infamy of both, is a conduct not only baſe and criminal, but inconſiſtent with that truly rational and refined enjoyment, the ſpirit and quinteſſence of which is derived from the baſhful and ſacred charms of virtue kept untainted, and therefore ever alluring to the lover's heart.

Courteſy, good-neighbourhoood, affability, and the like duties which are founded on our private ſocial connections, are no leſs neceſſary and obligatory to creatures united in ſociety, and ſupporting and ſupported by each other in a chain of mutual want and dependence. They do not conſiſt in a ſmooth addreſs, an artificial or obſequious air, fawning adulation, or a polite ſervility of manners; but in a juſt and modeſt ſenſe of our own dignity and that of others, and of the reverence due to mankind, eſpecially to thoſe who hold the higher links of the ſocial chain; in a diſcreet and manly accommodation of ourſelves to the the foibles and humours of others; in a ſtrict obſervance of the rules of decorum and civility; but above all in a frank obliging carriage, and generous interchange of good deeds rather than words. Such a conduct is of great uſe and advantage, as it is an excellent ſecurity againſt injury, and the beſt claim and recommendation to the eſteem, civility, and univerſal reſpect of mankind. This inferior order of virtues unites the particular members of ſociety more cloſely, and form the leſſer pillars of the civil fabric; which, in many inſtances, ſupply the unavoidable defects of laws, and maintain the harmony and decorum of ſocial intercourſe, where the more important and eſſential lines of virtue are wanting.

Charity and forgiveneſs are truly amiable and uſeful duties of the ſocial kind. There is a twofold diſtinction of rights commonly taken notice of by moral writers, *viz.* perfect and imperfect. To fulfil the former, is neceſſary to the being and ſupport of ſociety; to fulfil the latter, is a duty equally ſacred and obligatory, and tends to the improvement and proſperity of ſociety: but as the violation of them is not equally prejudicial to the public good, the fulfilling them is not ſubjected to the cognizance of laws, but left to the candor, humanity, and gratitude of individuals. And by this means ample ſcope is given to exerciſe all the generoſity, and diſplay the genuine merit and luſtre of virtue. Thus the wants and misfortunes of others call for our charitable aſſiſtance and ſeaſonable ſupplies: and the good man, unconſtrained by law, and uncontrouled by human authority, will chearfully acknowledge and generouſly ſatisfy this mournful and moving claim; a claim ſupported by the ſanction of heaven, of whoſe bounties he is honoured to be the grateful truſtee. If his own perfect rights are invaded by the injuſtice of others, he will not therefore reject their imperfect right to pity and forgiveneſs, unleſs his grant of theſe ſhould be inconſiſtent with the more extenſive rights of ſociety or the public good. In that caſe he will have recourſe to public juſtice and the laws; and even then he will proſecute the injury with no unneceſſary ſeverity, but rather with mildneſs and humanity. When the injury is merely perſonal, and of ſuch a nature as to admit of alleviations, and the forgiveneſs of which would be attended with no worſe conſequences, eſpecially of a public kind, the good man will generouſly forgive his offending brother. And it is his duty to do ſo, and not to take private revenge, or retaliate evil for evil. For though reſentment of injury is a natural paſſion, and implanted, as was obſerved above, for wiſe and good ends; yet, conſidering the manifold partialities which moſt men have for themſelves, was every one to act as judge in his own cauſe, and to execute the ſentence dictated by his own reſentment, it is but too evident that mankind would paſs all bounds in their fury, and the laſt ſufferer be provoked in his turn to make full repriſals. So that evil, thus encountering with evil, would produce one continued ſeries of violence and miſery, and render ſociety intolerable, if not impracticable. Therefore, where the ſecurity of the individual, or good of the public, does not require a proportionable retaliation, it is agreeeble to the general law of benevolence, and to the particular end of the paſſion (which is to prevent injury, and the miſery occaſioned by it) to forgive perſonal injuries, or not to return evil for evil. This duty is one of the noble refinements which Chriſtianity has made upon the general maxims and practice of mankind, and enforced with a peculiar ſtrength and beauty by ſanctions no leſs alluring than awful. And indeed the practice of it is generally its own reward; by expelling from the mind the moſt dreadful intruders upon its repoſe, thoſe rancorous paſſions which are begot and nurſed by reſentment; and by diſarming and even ſubduing every enemy one has, except ſuch as have nothing left of men but the outward form.

The moſt enlarged and humane connection of the private kind, ſeems to be the hoſpitable alliance from which flow the amiable and diſintereſted duties we owe to ſtrangers. If the exerciſe of paſſions of the moſt private and inſtinctive kind is beheld with moral approbation and delight, how lovely and venerable muſt thoſe appear, which reſult from a calm philanthropy, are founded in the common rights and connections of ſociety, and embrace men, not

not of a particular ſect, party, or nation, but all in general without diſtinction, and without any of the little partialities of ſelf-love!

Social Duties of the COMMERCIAL *Kind.*

THE next order of connections are thoſe which ariſe from the wants and weakneſs of mankind, and from the various circumſtances in which their different ſituations place them. Theſe we may call *commercial connections;* and the duties which reſult from them *commercial duties*, as juſtice, fair-dealing, ſincerity, fidelity to compacts, and the like.

Though nature is perfect in all her works, yet ſhe has obſerved a manifeſt and eminent diſtinction among them. To all ſuch as lie beyond the reach of human ſkill and power, and are properly of her own department, ſhe has given the finiſhing hand. Theſe man may deſign after and imitate; but he can neither rival them, nor add to their beauty or perfection: ſuch are the forms and ſtructure of vegetables, animals, and many of their productions. There are others of her works which ſhe has of deſign left unfiniſhed, as it were, in order to exerciſe the ingenuity and power of man. She has preſented to him a rich profuſion of materials of every kind for his conveniency and uſe; but they are rude and unpoliſhed, or not to be come at without art and labour. Theſe therefore he muſt apply, in order to adapt them to his uſe, and to enjoy them in perfection. Thus nature has given him an infinite variety of herbs, grain, foſſils, minerals, wood, water, earth, and a thouſand other crude materials to ſupply his numerous wants. But he muſt ſow, plant, dig, refine, poliſh, build, and, in ſhort, manufacture the various produce of nature, in order to obtain even the neceſſaries, and much more the conveniencies and elegancies of life. Theſe, then, are the price of his labour and induſtry; and, without that, nature will ſell him nothing. But as the wants of mankind are many, and the ſingle ſtrength of individuals ſmall, they could hardly find the neceſſaries, and much leſs the conveniencies of life, without uniting their ingenuity and ſtrength in acquiring theſe, and without a mutual intercourſe of good offices. Some men are better formed for ſome kinds of ingenuity and labour, and others for other kinds; and different ſoils and climates are enriched with different productions; ſo that men, by exchanging the produce of their reſpective labours, and ſupplying the wants of one country with the ſuperfluities of another, do, in effect, diminiſh the labours of each, and increaſe the abundance of all. This is the foundation of all commerce, or exchange of commodities and goods one with another; in order to facilitate which, men have contrived different ſpecies of coin or money, as a common ſtandard by which to eſtimate the comparative values of their reſpective goods. But, to render commerce ſure and effectual, juſtice, fair-dealing, ſincerity, and fidelity to compacts are abſolutely neceſſary.

Juſtice, or fair dealing, or, in other words, a diſpoſition to treat others as we would be treated by them, is a virtue of the firſt importance, and inſeparable from the virtuous character. It is the cement of ſociety, or that pervading ſpirit which connects its members, inſpires its various relations, and maintains the order and ſubordination of each part to the whole. Without it, ſociety would become a den of thieves and banditti, hating and hated, devouring and devoured, by one another.

Sincerity or veracity in our words and actions is another virtue or duty of great importance to ſociety, being one of the great bands of mutual intercourſe, and the foundation of mutual truſt. Without it, ſociety would be the dominion of miſtruſt, jealouſy and fraud, and converſation a traffick of lies and diſſimulation. It includes in it a conformity of our words with our ſentiments, a correſpondence between our actions and diſpoſitions, a ſtrict regard to truth, and an irreconcileable abhorrence of falſehood. It does not indeed require that we expoſe our ſentiments indiſcreetly, or tell all the truth in every caſe; but certainly it does not and cannot admit the leaſt violation of truth, or contradiction to our ſentiments. For if theſe bounds are once paſſed, no poſſible limit can be aſſigned where the violation ſhall ſtop; and no pretence of private or public good can poſſibly counterbalance the ill conſequences of ſuch a violation.

Fidelity to promiſes, compacts and engagments, is likewiſe a duty of ſuch importance to the ſecurity of commerce and interchange of benevolence among mankind, that ſociety would ſoon grow intolerable without the ſtrict obſervance of it. Hobbes, and others who follow the ſame track, have taken a worderful deal of pains to puzzle this ſubject, and to make all the virtues of this ſort merely artificial, and not at all obligatory, antecedent to human conventions. No doubt, compacts ſuppoſe people who make them, and promiſes ſuppoſe perſons to whom they are made; and therefore both ſuppoſe ſome ſociety more or leſs between thoſe who enter into theſe mutual engagements. But is not a compact or promiſe binding, till men have agreed that they ſhall be binding? Or are they only binding becauſe it is our intereſt to be bound by them, or to fulfill them? Do not we highly approve the man who fufills them, even though they ſhould prove to be againſt his intereſt? And do not we condemn him as a knave, who violates them on that account? A promiſe is a voluntary declaration, by words, or by an action equally ſignificant, of our reſolution to do ſomething in behalf of another, or for his ſervice. When a promiſe is made, the perſon who makes it is by all ſuppoſed under an obligation to perform it; and he to whom it is made may demand the performance as his right. That perception of obligation is a ſimple idea, and is on the ſame footing as our other moral perceptions, which may be deſcribed by inſtances, but cannot be defined. Whether we have a perception of ſuch obligation quite diſtinct from the intereſt, either public or private, that may accompany the fulfilment of it, muſt be referred to the conſcience of every individual. And, whether the mere ſenſe of that obligation, apart from its concomitants, is not a ſufficient inducement or motive to keep one's promiſe, without having recourſe to any ſelfiſh principal of our nature, muſt be likewiſe appealed to the conſcience of every honeſt man. Fair dealing and fidelity to compacts require that we take no advantage of the ignorance, paſſion, or incapacity of others, from whatever cauſe that incapacity ariſes;—that we be explicit and candid in making bargains, juſt and faithful

faithful in fulfilling our part of them. And if the other party violates his engagements, redreſs is to be ſought from the laws, or from thoſe who are intruſted with the execution of them. In fine, the commercial virtues and duties require that we not only do not invade, but maintain the rights of others;—that we be fair and impartial in transferring, bartering, or exchanging property, whether in goods or ſervice;—and be inviolably faithful to our word and our engagements, where the matter of them is not criminal, and where they are not extorted by force.

Social Duties of the Political *Kind.*

We are now arrived at the laſt and higheſt order of duties reſpecting ſociety, which reſult from the exerciſe of the moſt generous and heroic affections, and are founded on our moſt elegant connections.

The ſocial principle in man is of ſuch an expanſive nature, that it cannot be confined within the circuit of a family, of friends, or a neighbourhood; it ſpreads into wider ſyſtems, and draws men into larger confederacies, communities, and commonwealths.—It is in theſe only that the higher powers of our nature attain the higheſt improvement and perfection of which they are capable. Theſe principles hardly find objects in the ſolitary ſtate of nature. There the principle of action riſes no higher at fartheſt than natural affection towards one's offspring. There perſonal or family-wants entirely engroſs the creature's attention and labour, and allow no leiſure, or, if they did, no exerciſe for views and affections of a more enlarged kind. In ſolitude all are employed in the ſame way, in providing for the animal life. And even after their utmoſt labour and care, ſingle and unaided by the induſtry of others, they find but a ſorry ſupply of their wants, and a feeble precarious ſecurity againſt dangers from wild beaſts, from inclement ſkies and ſeaſons, from the miſtakes or petulant paſſions of their fellow-creatures, from their preference of themſelves to their neighbours, and from all the little exorbitances of ſelf-love. But in ſociety, the mutual aids which men give and receive ſhorten the labours of each, and the combined ſtrength and reaſon of individuals give ſecurity and protection to the whole body. There is both a variety and ſubordination of genius among mankind. Some are formed to lead and direct others; to contrive plans of happineſs for individuals, and of government for communities; to take in a public intereſt; to invent laws and arts, and ſuperintend their execution; and, in ſhort, to refine and civilize human life. Others, who have not ſuch good heads, may have as honeſt hearts, a truly public ſpirit, love of liberty, hatred of corruption and tyranny, a generous ſubmiſſion to laws, order, and public inſtitutions, and an extenſive philanthropy. And others, who have none of thoſe capacities either of heart, or head, may be well formed for manual exerciſes and bodily labour. The former of theſe principles have no ſcope in ſolitude, where a man's thoughts and concerns do all either center in himſelf, or extend no farther than a family; into which little circle all the duty and virtue of the ſolitary mortal is crouded. But ſociety finds proper objects and exerciſes for every genius, and the nobleſt objects and exerciſes for the nobleſt geniuſes, and for the higheſt principles in the human conſtitution: particularly for that warmeſt and moſt divine paſſion, which God hath kindled in our boſoms, the inclination of doing good, and reverencing our nature; which may find here both employment, and the moſt exquiſite ſatisfaction. In ſociety a man has not only more leiſure, but better opportunities of applying his talents with much greater perfection and ſucceſs, eſpecially as he is furniſhed with the joint advice and aſſiſtance of his fellow-creatures, who are now more cloſely united one with the other, and ſuſtain a common relation to the ſame moral ſyſtem, or community. This then is an object proportioned to his moſt enlarged ſocial affections, and in ſerving it he finds ſcope for the exerciſe and refinement of his higheſt intellectual and moral powers. Therefore ſociety, or a ſtate of civil government, reſts on theſe two principal pillars; "that in it we find ſecurity againſt thoſe evils which are unavoidable in ſolitude; and obtain thoſe goods, ſome of which cannot be obtained at all, and others not ſo well, in that ſtate, where men depend ſolely on their individual ſagacity and induſtry."

From this ſhort detail it appears that man is a ſocial creature, and formed for a ſocial ſtate; and that ſociety, being adapted to the higher principles and deſtinations of his nature, muſt, of neceſſity, be his natural ſtate.

The duties ſuited to that ſtate, and reſulting from thoſe principles and deſtinations, or, in other words, from our ſocial paſſions and ſocial connections, or relation to a public ſyſtem, are love of our country, reſignation and obedience to the laws, public ſpirit, love of liberty, ſacrifice of life and all to the public, and the like.

Love of our country is one of the nobleſt paſſions that can warm and animate the human breaſt. It includes all the limited and particular affections to our parents, children, friends, neighbours, fellow-citizens, countrymen. It ought to direct and limit their more confined and partial actions within their proper and natural bounds, and never let them incroach on thoſe ſacred and firſt regards we owe to the great public to which we belong. Were we ſolitary creatures, detached from the reſt of mankind, and without any capacity of comprehending a public intereſt, or without affections leading us to deſire and purſue it, it would not be our duty to mind it, nor criminal to neglect it. But, as we are parts of the public ſyſtem, and are not only capable of taking in large views of its intereſts, but by the ſtrongeſt affections connected with it, and prompted to take a ſhare of its concerns, we are under the moſt ſacred ties to proſecute its ſecurity and welfare with the utmoſt ardor, eſpecially in times of public trial. This love of our country does not import an attachment to any particular ſoil, climate, or ſpot of earth, where perhaps we firſt drew our breath, though thoſe natural ideas are often aſſociated with the moral ones, and, like external ſigns or ſymbols, help to aſcertain and bind them; but it imports an affection to that moral ſyſtem, or community, which is governed by the ſame laws and magiſtrates, and whoſe ſeveral parts are variouſly connected one with the other, and all united upon the bottom of a common intereſt. Perhaps indeed every member of the community cannot comprehend ſo large an object, eſpecially if it extends through large provinces,

provinces, and over vast tracts of land; and still less can he form such an idea, if there is no public, *i. e.* if all are subjected to the caprice and unlimited will of one man: but the preference the generality shew to their native country, the concern and longing after it which they express when they have been long absent from it, the labours they undertake and sufferings they endure to save or serve it, and the peculiar attachment they have to their countrymen, evidently demonstrate that the passion is natural, and never fails to exert itself, when it is fairly disengaged from foreign clogs, and is directed to its proper object. Where-ever it prevails in its genuine vigour and extent, it swallows up all sordid and selfish regards; it conquers the love of ease, power, pleasure and wealth; nay, when the amiable partialities of friendship, gratitude, private affection, or regard to a family come in competition with it, it will teach us bravely to sacrifice all, in order to maintain the rights and promote or defend the honour and happiness of our country.

Resignation and obedience to the laws and orders of the society to which we belong, are political duties necessary to its very being and security, without which it must soon degenerate into a state of licence and anarchy. The welfare, nay, the nature of civil society, requires that there should be a subordination of orders or diversity of ranks and conditions in it;—that certain men, or orders of men, be appointed to superintend and manage such affairs as concern the public safety and happiness;—that all have their particular provinces assigned them;—that such a subordination be settled among them, as none of them may interfere with another;—and finally, that certain rules or common measures of action be agreed on, by which each is to discharge his respective duty to govern or be governed, and all may concur in securing the order and promoting the felicity of the whole political body. Those rules of action are the laws of the community; and those different orders are the several officers, or magistrates, appointed by the public to explain them, and superintend or assist in their execution. In consequence of this settlement of things, it is the duty of each individual to obey the laws enacted, to submit to the executors of them with all due deference and homage according to their respective ranks and dignity, as to the keepers of the public peace, and the gurdians of public liberty; to maintain his own rank, and perform the functions of his own station with diligence, fidelity, and incorruption. The superiority of the higher orders, or the authority with which the state has invested them, entitle them, especially if they employ their authority well, to the obedience and submission of the lower, and to a proportionable honour and respect from all. The subordination of the lower ranks claims protection, defence, and security from the higher. And the laws, being superior to all, require the obedience and submission of all; being the last resort, beyond which there is no decision or appeal.

Public spirit, heroic zeal, love of liberty, and the other political duties, do, above all others, recommend those who practise them to the admiration and homage of mankind; because, as they are the offspring of the noblest minds, so are they the parents of the greatest blessings to society. Yet, exalted as they are, it is only in equal and free governments where they can be exercised and have their due effect: for there only does a true public prevail, and there only is the public good made the standard of the civil constitution. As the end of society is the common interest and welfare of the people associated, this end must of necessity be the supreme law or common standard by which the particular rules of action of the several members of the society towards each other are to be regulated. But a common interest can be no other than that which is the result of the common reason, or common feelings of all. Private men, or a particular order of men, have interests and feelings peculiar to themselves, and of which they may be good judges: but these may be separate from, and often contrary to the interests and feelings of the rest of the society; and therefore they can have no right to make, much less to impose, laws on their fellow-citizens, inconsistent with, or opposite to, those interests and those feelings. Therefore a society, a government, a real public, truly worthy the name; and not a confederacy of banditti, a clan of lawless savages, or a band of slaves under the whip of a master; must be such a one as consists of freemen, chusing or consenting to laws themselves, or, since it often happens that they cannot assemble and act in a collective body, delegating a sufficient number of representatives, *i. e.* such a number as shall most fully comprehend, and most equally represent, their common feelings and common interests, to digest and vote laws for the conduct and controul of the whole body the most agreeable to those common feelings and common interests.

A society thus constituted by common reason, and formed on the plan of a common interest, becomes immediately an object of public attention, public veneration, public obedience, a public and inviolable attachment, which ought neither to be seduced by bribes, nor awed by terrors; an object, in fine, of all those extensive and important duties which arise from so glorious a confederacy. To watch over such a system; to contribute all he can to promote its good by his reason, his ingenuity, his strength, and every other ability, whether natural or acquired; to resist, and to the utmost of his power defeat, every incroachment upon it, whether carried on by secret corruption, or open violence; and to sacrifice his ease, his wealth, his power, nay life itself, and, what is dearer still, his family and friends, to defend or save it; is the duty, the honour, the interest, and the happiness of every citizen; it will make him venerable and beloved while he lives, be lamented and honoured if he falls in so glorious a cause, and transmit his name with immortal renown to the latest posterity.

As the people are the fountain of power and authority, the original seat of majesty, the authors of laws, and the creators of officers to execute them; if they shall find the power they have conferred abused by their trustees, their majesty violated by tyranny or by usurpation, their authority prostituted to support violence or screen corruption, the laws grown pernicious through accidents unforeseen or unavoidable, or rendered ineffectual thro' the infidelity and corruption of the executors of them; then it is their right, and what is their right is their du-

ty, to reſume that delegated power, and call their truſtees to an account; to reſiſt the uſurpation, and extirpate the tyranny; to reſtore their ſullied majeſty and proſtituted authority; to ſuſpend, alter, or abrogate thoſe laws, and puniſh their unfaithful and corrupt officers. Nor is it the duty only of the united body, but every member of it ought, according to his reſpective rank, power, and weight in the community, to concur in advancing and ſupporting thoſe glorious deſigns.

Duty to God.

Of all the relations which the human mind ſuſtains, that which ſubſiſts between the Creator and his creatures, the Supreme Lawgiver and his ſubjects, is the higheſt and the beſt. This relation ariſes from the nature of a creature in general, and the conſtitution of the human mind in particular; the nobleſt powers and affections of which point to an Univerſal Mind, and would be imperfect and abortive without ſuch a direction. How lame then muſt that ſyſtem of morals be, which leaves a Deity out of the queſtion! How diſconſolate, and how deſtitute of its firmeſt ſupport!

It does not appear, from any true hiſtory or experience of the mind's progreſs, that any man, by any formal deduction of his diſcurſive powers, ever reaſoned himſelf into the belief a God. Whether ſuch a belief is only ſome natural anticipation of ſoul; or is derived from father to ſon, and from one man to another, in the way of tradition; or is ſuggeſted to us in conſequence of an immutable law of our nature, on beholding the auguſt aſpect and beautiful order of the univerſe; we will not pretend to determine. What ſeems moſt agreeable to experience is, that a ſenſe of its beauty and grandeur, and the admirable fitneſs of one thing to another in its vaſt apparatus, leads the mind neceſſarily and unavoidably to a perception of deſign, or of a deſigning cauſe, the origin of all, by a progreſs as ſimple and natural as that by which a beautiful picture or a fine building ſuggeſts to us the idea of an excellent artiſt. For it ſeems to hold univerſally true, that where-ever we diſcern a tendency or cooperation of things towards a certain end, or producing a common effect; there, by a neceſſary law of aſſociation, we apprehend deſign, a deſigning energy or cauſe: *See* Metaphysics. As we conceive this Being or Firſt Cauſe before all, above all, and greater than all, we naturally, and without reaſoning, aſcribe to him every kind of perfection, wiſdom, power, and goodneſs without bounds, exiſting through all time, and pervading all ſpace. We apply to him thoſe glorious epithets of our Creator, Preſerver, Benefactor, the Supreme Lord and Law-giver of the whole ſociety of rational intelligent creatures.—Not only the imperfections and wants of our being and condition, but ſome of the nobleſt inſtincts and affections of our minds, connect us with this great and univerſal nature. The mind, in its progreſs from object to object, from one character and proſpect of beauty to another, finds ſome blemiſh or deficiency in each, and ſoon exhauſts or grows weary and diſſatisfied with its ſubject: it ſees no character of excellency among men, equal to that pitch of eſteem which it is capable of exerting; no object within the compaſs of human things adequate to the ſtrength of its affection. Nor can it ſtop any where in this ſelf-expanſive progreſs, or find repoſe after its higheſt flights, till it arrives at a Being of unbounded greatneſs and worth, on whom it may employ its ſublimeſt powers without exhauſting the ſubject, and give ſcope to the utmoſt force and fullneſs of its love without ſatiety or diſguſt. So that the nature of this Being correſponds to the nature of man; nor can his intelligent and moral powers obtain their entire end, but on the ſuppoſition of ſuch a Being, and without a real ſympathy and communication with him. The native propenſity of the mind to reverence whatever is great and wonderful in nature, finds a proper object of homage in him who ſpread out the heavens and the earth, and who ſuſtains and governs the whole of things. The admiration of beauty, the love of order, and the complacency we feel in goodneſs, muſt riſe to the higheſt pitch, and attain the full vigour and joy of their operations, when they unite in Him who is the ſum and ſource of all perfection.

It is evident, from the ſlighteſt ſurvey of morals, that how punctual ſoever one may be in performing the duties which reſult from our relations to mankind; yet to be quite deficient in performing thoſe which ariſe from our relation to the Almighty, muſt argue a ſtrange perverſion of reaſon or depravity of heart. If imperfect degrees of worth attract our veneration, and if the want of it would imply an inſenſibility, or, which is worſe, an averſion to merit; what lameneſs of affection, and immorality of character, muſt it be, to be unaffected with, and much more to be ill-affected to, a Being of ſuperlative worth! To love ſociety, or particular members of it, and yet to have no ſenſe of our connection with its Head, no affection to our common Parent and Benefactor; to be concerned about the approbation or cenſure of our fellow-creatures, and yet to feel nothing of this kind towards Him who ſees and weighs our actions with unerring wiſdom and juſtice, and can fully reward or puniſh them; betrays equal madneſs and partiality of mind. It is plain, therefore, beyond all doubt, that ſome regards are due to the great Father of all, in whom every lovely and adorable quality combines to inſpire veneration and homage.

As it has been obſerved already, that our affections depend on our opinions of their objects, and generally keep pace with them, it muſt be of the higheſt importance, and ſeems to be among the firſt duties we owe to the Author of our being, "to form the leaſt imperfect, ſince we cannot form perfect conceptions of his character and adminiſtration." For ſuch conceptions, thoroughly imbibed, will render our religion rational, and our diſpoſitions refined. If our opinions are diminutive and diſtorted, our religion will be ſuperſtitious, and our temper abject. The foundation, then, of all true religion is a rational faith. And of a rational faith theſe ſeem to be the chief articles: To believe, "that an infinite all-perfect Mind exiſts, who has no oppoſite nor any ſeparate intereſt from that of his creatures:—that he ſuperintends and governs all creatures and things:—that his goodneſs extends to all his creatures, in different degrees indeed, according to their reſpective natures, but without any partiality or envy:—that he does every thing for the beſt, or

or in a ſubſerviency to the perfection and happineſs of the whole;—particularly, that he directs and governs the affairs of men,—inſpects their actions,—diſtinguiſhes the good from the bad,—loves and befriends the former,—is diſpleaſed with and pities the latter in this world,—and will, according to their reſpective deſerts, reward the one, and puniſh the other in the next:—that, in fine, he is always carrying on a ſcheme of virtue and happineſs through an unlimited duration,—and is ever guiding the univerſe through its ſucceſſive ſtages and periods, to higher degrees of perfection and felicity." This is true theiſm, the glorious ſcheme of divine faith; a ſcheme exhibited in all the works of God, and executed through his whole adminiſtration.

This faith, well-founded and deeply felt, is nearly connected with a true moral taſte, and hath a powerful efficacy on the temper and manners of the theiſt. He who admires goodneſs in others, and delights in the practice of it, muſt be conſcious of a reigning order within, a rectitude and candor of heart which diſpoſes him to entertain favourable apprehenſions of men, and, from an impartial ſurvey of things, to preſume that good order and good meaning prevail in the univerſe; and if good meaning and good order, then an ordering and intending Mind, who is no enemy, no tyrant to his creatures, but a friend, a benefactor, an indulgent ſovereign.—On the other hand, a bad man, having nothing goodly or generous to contemplate within, no right intentions, nor honeſty of heart, ſuſpects every perſon and every thing; and beholding nature through the gloom of a ſelfiſh and guilty mind, is either averſe to the belief of a reigning order; or, if he cannot ſuppreſs the unconquerable anticipations of a governing mind, he is prone to tarniſh the beauty of nature, and to impute malevolence, or blindneſs and impotence at leaſt, to the Sovereign Ruler. He turns the univerſe into a forlorn and horrid waſte; and transfers his own character to the Deity, by aſcribing to him that uncommunicative grandeur, that arbitrary or revengeful ſpirit which he affects or admires in himſelf. As ſuch a temper of mind naturally leads to atheiſm, or to a ſuperſtition full as bad; therefore, as far as that temper depends on the unhappy creature in whom it prevails, the propenſity to atheiſm or ſuperſtition conſequent thereto muſt be immoral. Farther, if it be true that the belief or ſenſe of a Deity is natural to the mind, and the evidence of his exiſtence reflected from his works ſo full as to ſtrike even the moſt ſuperficial obſerver with conviction; then the ſupplanting or corrupting that ſenſe, or the want of due attention to that evidence, and, in conſequence of both, a ſupine ignorance or affected unbelief of a Deity, muſt argue a bad temper, or an immoral turn of mind. In the caſe of invincible ignorance, or a very bad education, though nothing can be concluded directly againſt the character, yet whenever ill paſſions and habits pervert the judgment, and by perverting the judgment terminate in atheiſm, then the caſe becomes plainly criminal.

But let caſuiſts determine this as they will, a true faith in the divine character and adminiſtration is generally the conſequence of a virtuous ſtate of mind. The man who is truly and habitually good, feels the love of order, of beauty, and goodneſs, in the ſtrongeſt degree; and therefore cannot be inſenſible to thoſe emanations of them which appear in all the works of God, nor help loving their Supreme Source and Model. He cannot but think, that He who has poured ſuch beauty and goodneſs over all his works, muſt Himſelf delight in beauty and goodneſs, and what He delights in muſt be both amiable and happy. Some indeed there are, and it is pity there ſhould be any ſuch, who, through the unhappy influence of a wrong education, have entertained dark and unfriendly thoughts of a Deity and his adminiſtration, though otherwiſe of a virtuous temper themſelves. However, it muſt be acknowledged, that ſuch ſentiments have, for the moſt part, a bad effect on the temper; and when they have not, it is becauſe the undepraved affections of an honeſt heart are more powerful in their operation, than the ſpeculative opinions of an ill-formed head.

But where-ever right conceptions of the Deity and his providence prevail, when he is conſidered as the inexhauſted ſource of light and love and joy, as acting in the joint character of a father and governor, imparting an endleſs variety of capacities to his creatures, and ſupplying them with every thing neceſſary to their full completion and happineſs, what veneration and gratitude muſt ſuch conceptions thoroughly believed excite in the mind! How natural and delightful muſt it be to one whoſe heart is open to the perception of truth, and of every thing fair, great, and wonderful in nature, to contemplate and adore Him, who is the Firſt Fair, the Firſt Great, and Firſt Wonderful; in whom wiſdom, power and goodneſs dwell vitally, eſſentially, originally, and act in perfect concert! What grandeur is here to fill the moſt enlarged capacity, what beauty to engage the moſt ardent love, what a maſs of wonders in ſuch exuberance of perfection, to aſtoniſh and delight the human mind through an unfailing duration!

If the Deity is conſidered as our ſupreme guardian and benefactor, as the father of mercies, who loves his creatures with infinite tenderneſs, and in a particular manner all good men, nay, who delights in goodneſs even in its moſt imperfect degrees; what reſignation, what dependence, what generous confidence, what hope in God and his all-wiſe providence, muſt ariſe in the ſoul that is poſſeſſed of ſuch amiable views of him! All thoſe exerciſes of piety, and above all a ſuperlative eſteem and love, are directed to God as to their natural, their ultimate, and indeed their only adequate object: and though the immenſe obligations we have received from him may excite in us more lively feelings of divine goodneſs than a general and abſtracted contemplation of it; yet the affections of gratitude and love are themſelves of the generous diſintereſted kind, not the reſult of ſelf intereſt, or views of reward. A perfect character, in which we always ſuppoſe infinite goodneſs, guided by unerring wiſdom, and ſupported by almighty power, is the proper object of perfect love; and though that character ſuſtains to us the relation of a benefactor, yet the mind, deeply ſtruck with that perfection, is quite loſt amidſt ſuch a blaze of beau-

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ty, and grows as it were insensible to those minuter irradiations of it upon itself. To talk, therefore, of a mercenary love of God, or which has fear for its principal ingredient, is equally impious and absurd. If we do not love the loveliest object in the universe for his own sake, no prospect of good or fear of ill can ever bribe our esteem, or captivate our love. These affections are too noble to be bought or sold, or bartered in the way of gain; worth, or merit, as their object, and their reward is something similar in kind. Whoever indulges such sentiments and affections towards the Deity, must be confirmed in the love of virtue, in a desire to imitate its all-perfect Pattern, and in a cheerful security that all his great concerns, those of his friends and of the universe, shall be absolutely safe under the conduct of unerring wisdom and unbounded goodness. It is in his care and providence alone that the good man, who is anxious for the happiness of all, finds perfect serenity, a serenity neither ruffled by partial ill, nor soured by private disappointment.

When we consider the unstained purity and absolute perfection of the divine nature, and reflect withal on the imperfection and various blemishes of our own, we must sink, or be convinced we ought to sink, into the deepest humility and prostration of soul before Him who is so wonderfully great and holy. When, farther, we call to mind what low and languid feelings we have of the Divine Presence and Majesty; what insensibility of his fatherly and universal goodness, nay, what ungrateful returns we have made to it; how far we come short of the perfection of his law, and the dignity of our own nature; how much we have indulged to the selfish passions, and how little to the benevolent ones; we must be conscious that it is our duty to repent of a temper and conduct so unworthy our nature, and unbecoming our obligations to its Author, and to resolve and endeavour to act a wiser and better part for the future.

Nevertheless, from the character which his works exhibit of him, from those delays or alleviations of punishment which offenders often experience, and from the merciful tenour of his administration in many other instances, the sincere penitent may entertain good hopes that his Parent and Judge will not be strict to mark iniquity, but will be propitious and favourable to him, if he honestly endeavours to avoid his former practices, and subdue his former habits, and to live in a greater conformity to the divine will for the future. If any doubts or fears should still remain, how far it may be consistent with the rectitude and equity of the divine government to let his iniquities pass unpunished; yet he cannot think it unsuitable to his paternal clemency and wisdom to contrive a method of retrieving the penitent offender, that shall unite and reconcile the majesty and mercy of his government. If reason cannot of itself suggest such a scheme, it gives at least some ground to expect it. But though natural religion cannot let in more light and assurance on so interesting a subject, yet it will teach the humble theist to wait with great submission for any farther intimations it may please the Supreme Governor to give of his will; examine with candour and impartiality whatever evidence shall be proposed to him of a divine revelation, whether that evidence is natural or supernatural; to embrace it with veneration and cheerfulness, if the evidence is clear and convincing; and finally, if it bring to light any new relations or connections, natural religion will persuade its sincere votary faithfully to comply with the obligations, and perform the duties which result from those relations and connections. —This is theism, piety, the completion of morality!

We must further observe, that all those affections which we supposed to regard the Deity as their immediate and primary object, are vital energies of the soul, and consequently exert themselves into act; and like all its other energies, gain strength or greater activity by that exertion, It is therefore our duty, as well as highest interest, often, at stated times, and by decent and solemn acts, to contemplate and adore the great Original of our existence, the Parent of all beauty, and of all good; to express our veneration and love, by an awful and devout recognition of his perfections; and to evidence our gratitude, by celebrating his goodness, and thankfully acknowledging all his benefits. It is likewise our duty, by proper exercises of sorrow and humiliation, to confess our ingratitude and folly; to signify our dependence on God, and our confidence in his goodness, by imploring his blessing and gracious concurrence in assisting the weakness, and curing the corruptions of our nature; and finally, to testify our sense of his authority, and our faith in his government, by devoting ourselves to do his will, and resigning ourselves to his disposal. These duties are not therefore obligatory, because the Deity needs or can be profited by them; but as they are apparently decent and moral; suitable to the relations he sustains of our Creator, Benefactor, Law-giver and Judge; expressive of our state and obligations; and improving to our tempers, by making us more rational, social, godlike, and consequently more happy.

We have now considered internal piety, or the worship of the mind, that which is in spirit and in truth; we shall conclude the section with a short account of that which is external. External worship is founded on the same principles as internal, and of a strict moral oligation. It is either private or public. Devotion, that is inward, or purely intellectual, is too spiritual and abstracted an operation for the bulk of mankind. The operations of their minds, such especially as are employed on the most sublime immaterial objects, must be assisted by their outward organs, or by some help from the imagination, otherwise they will be soon dissipated by sensible impressions, or grow tiresome if too long continued. Ideas are such fleeting things that they must be fixed, and so subtle that they must be expressed and delineated, as it were, by sensible marks and images; otherwise we cannot attend at them, nor be much affected to them. Therefore verbal adoration, prayer, praise, thanksgiving, and confession, are admirable aids to inward devotion, fix our attention, compose and enliven our thoughts, impress us more deeply with a sense of the awful presence in which we are, and, by a natural and mechanical sort of influence, tend to heighten those devout feelings and affections which we ought to entertain, and after this manner reduce into formal and explicit act.

This holds true in an higher degree in the case of public worship, where the presence of our fellow-creatures, and the powerful contagion of the social affections, conspire to kindle and spread the devout flame with greater energy.

energy. To conclude: As God is the parent and head of the social system; as he has formed us for a social state; as by one we find the best security against the ills of life, and in the other enjoy its greatest comforts; and as, by means of both, our nature attains its highest improvement and perfection; and moreover, as there are public blessings and crimes in which we all share in some degree, and public wants and dangers to which all are exposed; it is therefore evident, that the various and solemn offices of public religion, are duties of indispensable moral obligation, among the best cements of society, the firmest prop of government, and the fairest ornament of both.

Of Practical Ethics, *or the* Culture *of the* Mind.

We have now gone through a particular detail of the several duties we owe to ourselves, to society, and to God. In considering the first order of duties, we just touched on the methods of acquiring the different kinds of goods which we are led by nature to pursue; only we left the consideration of the method of acquiring the moral goods of the mind to a section by itself, because of its singular importance. This section, then, will contain a brief enumeration of the arts of acquiring virtuous habits, and of eradicating vitious ones, as far as is consistent with the brevity of such a work; a subject of the utmost difficulty as well as importance in morals; to which, nevertheless, the least attention has been generally given by moral writers, especially those of a modern date. This will properly follow a detail of duty, as it will direct us to such means or helps as are most necessary and conducive to the practice of it.

In the first part of this inquiry we traced the order in which the passions shoot up in the different periods of human life. That order is not accidental, nor dependent on the caprice of men, or the influence of custom and education; but arises from the original constitution and laws of our nature; of which this is one, *viz.* "That sensible objects make the first and strongest impressions on the mind." These, by means of our outward organs, being conveyed to the mind, become objects of its attention on which it reflects when the outward objects are no longer present, or, in other words, when the impressions upon the outward organs cease. These objects of the mind's reflection are called *ideas* or *images*. Towards these, by another law of our nature, we are not altogether indifferent; but correspondent movements of desire or aversion, love or hatred, arise, according as the objects of which they are images or copies made an agreeable or disagreeable impression on our organs. Those ideas and affections which we experience in the first period of life, we refer to the body, or to sense; and the taste which is formed towards them, we call a *sensible*, or a *merely natural* taste; and the objects corresponding to them we in general call *good* or *pleasant*.

But, as the mind moves forward in its course, it extends its views, and receives a new and more complex set of ideas, in which it observes uniformity, variety, similitude, symmetry of parts, reference to an end, novelty, grandeur. These compose a vast train and diversity of imagery, which the mind compounds, divides, and moulds into a thousand forms, in the absence of those objects which first introduced it. And this more complicated imagery suggests a new train of desires and affections, full as sprightly and engaging as any which have yet appeared. This whole class of perceptions or impressions is referred to the imagination, and forms an higher taste than the sensible, and which has an immediate and mighty influence on the finer passions of our nature, and is commonly termed a *fine taste*.

The objects which correspond to this taste we use to call beautiful, harmonious, great, or wonderful, or, in general, by the name of *beauty*.

The mind still pushing onwards, and increasing its stock of ideas, ascends from those to an higher species of objects, *viz.* the order and mutual relations of minds to each other, their reciprocal affections, characters, actions, and various aspects. In these it discovers a beauty, a grandeur, a decorum more interesting and alluring than in any of the former kinds. These objects, or the images of them, passing in review before the mind, do, by a necessary law of our nature, call forth another and nobler set of affections, as admiration, esteem, love, honour, gratitude, benevolence, and others of the like tribe. This class of perceptions, and their correspondent affections, we refer, because of their objects (manners,) to a moral sense; and call the taste or temper they excite, *moral*: and the objects which are agreeable to this taste or temper we denominate by the general name of *moral beauty*; in order to distinguish it from the other, which is termed *natural*.

These different sets of ideas or images are the materials about which the mind employs itself; which it blends, ranges, and diversifies ten thousand different ways. It feels a strong propension to connnect and associate those ideas among which it observes any similitude, or any aptitude, whether original and natural, or customary and artificial, to suggest each other. See Metaphysics.

But whatever the reasons are, whether similitude, coexistence, casuality, or any other aptitude or relation, why any two or more ideas are connected by the mind at first, it is an established law of our nature, "That when two or more ideas have often started in company, they form so strong an union, that it is very difficult ever after to separate them." Thus the lover cannot separate the idea of merit from his mistress; the courtier that of dignity from his title or ribbon; the miser that of happiness from his bags.—It is these associations of worth or happiness with any set of objects or images that form our taste or complex idea of good. By another law of our nature, "our affections follow and are governed by this taste; and to these affections our character and conduct are similar and proportioned, on the general tenor of which our happiness principally depends."

As all our leading passions, then, depend on the direction which our taste takes, and as it is always of the same strain with our leading associations, it is worth while to inquire a little more particularly how these are formed, in order to detect the secret sources from whence our passions derive their principal strength, their various rises and

and falls. For this will give us the true key to their management, and let us into the right method of correcting the bad, and improving the good.

No kind of objects makes ſo powerful an impreſſion on us as thoſe which are immedirtely impreſſed on our ſenſes, or ſtrongly painted on our imaginations. Whatever is purely intellectual, as abſtracted or ſcientific truths, the ſubtle relations and difference of things, has a fainter ſort of exiſtence in the mind; and, though it may exerciſe and whet the memory, the judgment, or the reaſoning powers, gives hardly any impulſe at all to the active powers, the paſſions, which are the main ſprings of motion. On the other hand, were the mind entirely under the direction of ſenſe, and impreſſible only by ſuch objects as are preſent and ſtrike ſome of the outward organs, we ſhould then be preciſely in the ſtate of the brute creation, and be governed ſolely by inſtinct or appetite, and have no power to controul whatever impreſſions are made upon us. Nature has therefore endued us with a middle faculty, wonderfully adapted to our mixed ſtate; which holds partly of ſenſe, and partly of reaſon; being ſtrongly allied to the former, and the common receptacle in which all the notices that come from that quarter are treaſured up; and yet greatly ſubſervient and miniſterial to the latter, by giving a body, a coherence, and beauty to its conceptions. This middle faculty is called the *imagination*, one of the moſt buſy and fruitful powers of the mind. Into this common ſtorehouſe are likewiſe carried all thoſe moral images or forms which are derived from our moral faculties of perception; and there they often undergo new changes and appearances, by being mixed and wrought up with the images and forms of ſenſible or natural things. By this coalition of imagery, natural beauty is dignified and heightened by moral qualities and perfections, and moral qualities are at once exhibited and ſet off by natural beauty. The ſenſible beauty, or good, is refined from its droſs by partaking of the moral; and the moral receives a ſtamp, a viſible character and currency from the ſenſible.

As we are firſt of all accuſtomed to ſenſible impreſſions and ſenſible enjoyments, we contract early a ſenſual reliſh or love of pleaſure in the lower ſenſe of the word. In order, however, to juſtify this reliſh, the mind, as it becomes open to higher perceptions of beauty and good, borrows from thence a nobler ſet of images, as fine taſte, generoſity, ſocial affection, friendſhip, good-fellowſhip, and the like; and, by dreſſing out the old purſuits with theſe new ornaments, gives them an additional dignity and luſtre. By theſe ways the deſire of a table, love of finery, intrigue, and pleaſure, are vaſtly increaſed beyond their natural pitch, having an impulſe combined of the force of the natural appetites and of the ſuperadded ſtrength of thoſe paſſions which tend to the moral ſpecies. —When the mind becomes more ſenſible to thoſe objects or appearances, in which it perceives beauty, uniformity, grandeur, and harmony, as fine cloaths, elegant furniture, plate, pictures, gardens, houſes, equipage, the beauty of animals, and particularly the attractions of the ſex; to theſe objects the mind is led by nature, or taught by cuſtom, the opinion and example of others, to annex certain ideas of moral character, dignity, decorum, honour, liberality, tenderneſs, and active or ſocial enjoyment. The conſequence of this aſſociation is, that the objects to which theſe are annexed, muſt riſe in their value, and be purſued with proportionable ardor. The enjoyment of them is often attended with pleaſure; and the mere poſſeſſion of them, where that is wanting, frequently draws reſpect from one's fellow-creatures: this reſpect is, by many, thought equivalent to the pleaſure of enjoyment. Hence it happens, that the idea of happineſs is connected with the mere poſſeſſion; which is therefore eagerly ſought after, without any regard to the generous uſe, or honourable enjoyment. Thus the paſſion reſting on the means, not the end, *i. e.* loſing ſight of its natural object, becomes wild and extravagant.

In fine, any object, or external denomination, a ſtaff, a garter, a cup, a crown, a title, may become a moral badge or emblem of merit, magnificence, or honour, according as theſe have been found or thought by the poſſeſſors or admirers of them to accompany them; yet, by the deception formerly mentioned, the merit or the conduct which entitled, or ſhould entitle, to thoſe marks of diſtinction, ſhall be forgot or neglected, and the badges themſelves be paſſionately affected, or purſued, as including every excellency. If theſe are attained by any means, all the concomitants which nature, cuſtom, or accidents have joined to them, will be ſuppoſed to follow of courſe. Thus moral ends, with which the unhappy admirer is apt to colour over his paſſion and views, will, in his opinion, juſtify the moſt immoral means, as proſtitution, adulation, fraud, treachery, and every ſpecies of knavery, whether more open or more diſguiſed.

When men are once engaged in active life, and find that wealth and power, generally called *intereſt*, are the great avenues to every kind of enjoyment, they are apt to throw in many engaging moral forms to the object of their purſuit, in order to juſtify their paſſion, and varniſh over the meaſures they take to gratify it; as, independency on the vices or paſſions of others, proviſion and ſecurity to themſelves and friends, prudent oeconomy or well-placed charity, ſocial communication, ſuperiority to their enemies who are all villains, honourable ſervice, and many other ingredients of merit. To attain ſuch capacities of uſefulneſs or enjoyment, what arts, nay, what meanneſſes can be thought blameable by thoſe cool purſuers of intereſt!——Nor have they, whom the gay world is pleaſed to indulge with the title of *men of pleaſure*, their imaginations leſs pregnant with moral images, with which they never fail to ennoble, or, if they cannot do that, to palliate their groſs purſuits. Thus, admiration of wit, of ſentiments and merit, friendſhip, love, generous ſympathy, mutual confidence, giving and receiving pleaſure, are the ordinary ingredients with which they ſeaſon their gallantry and pleaſurable entertainments; and by which they impoſe on themſelves, and endeavour to impoſe on others, that their amours are the joint iſſue of good ſenſe and virtue.

Theſe aſſociations, variouſly combined and proportioned by the imagination, form the chief private paſſions which govern the lives of the generality; as the love of action, of pleaſure, power, wealth, and fame: they influence the defenſive, and affect the public paſſions, and raiſe

joy

joy or ſorrow, as they are gratified or diſappointed. So that, in effect, theſe aſſociations of good and evil, beauty and deformity, and the paſſions they raiſe, are the main hinges of life and manners, and the great ſources of our happineſs or miſery. It is evident, therefore, that the whole of moral culture muſt depend on giving a right direction to the leading paſſions, and duly proportioning them to the value of the objects or goods purſued, under what name ſoever they may appear.

Now, in order to give them this right direction and due proportion, it appears, from the foregoing detail, that thoſe aſſociations of ideas, upon which the paſſions depend, muſt be duly regulated: that is to ſay, as an exorbitant paſſion for wealth, pleaſure, or power, flows from an aſſociation or opinion that more beauty and good, whether natural or moral, enters into the enjoyment or poſſeſſion of them, than really belongs to either; therefore, in reſtoring thoſe paſſions to their juſt proportion, we muſt begin with correcting the opinion, or breaking the falſe aſſociation; or, in other words, we muſt decompound the complex phantom of happineſs or good, which we fondly admire; diſunite thoſe ideas, that have no natural alliance; and ſeparate the original idea of wealth, power, or pleaſure, from the foreign mixtures incorporated with it, which enhance its value, or give it its chief power to enchant and ſeduce the mind. For inſtance, let it be conſidered how poor and inconſiderable a thing wealth is, if it be disjoined from real uſe, or from ideas of capacity in the poſſeſſor to do good, from independency, generoſity, proviſion for a family or friends, and ſocial communication with others. By this ſtandard let its true value be fixed; let its miſapplication, or unbenevolent enjoyment, be accounted ſordid and infamous; and nothing worthy or eſtimable be aſcribed to the mere poſſeſſion of it, which is not borrowed from its generous uſe.

If that complex form of good which is called *pleaſure*, engages us, let it be analyſed into its conſtituent principles, or thoſe allurements it draws from the heart and imagination, in order to heighten the low part of the indulgence; let the ſeparate and comparative moment of each be diſtinctly aſcertained, and deduced from that groſs part; and this remainder of the accumulative enjoyment will dwindle down into a poor, inſipid, tranſitory thing. In proportion as the opinion of the good purſued abates, the admiration muſt decay, and the paſſion loſe ſtrength of courſe. One effectual way to lower the opinion, and conſequently to weaken the habit founded on it, is to practice leſſer pieces of ſelf-denial, or to abſtain, to a certain pitch, from the purſuit or enjoyment of the favourite object; and, that this may be the more eaſily accompliſhed, one muſt avoid thoſe occaſions, that company, thoſe places, and the other circumſtances that inflamed one, and endeared the other: And, as a counter-proceſs, let higher or even different enjoyments be brought in view, other paſſions played upon the former, different places frequented, other exerciſes tried, company kept with perſons of a different or more correct way of thinking both in natural and moral ſubjects.

As much depends on our ſetting out well in life, let the youthful fancy, which is apt to be very florid and luxuriant, be early accuſtomed, by inſtruction, example, and ſignificant moral exerciſes, nay, by looks, geſtures, and every other teſtimony of juſt approbation or blame, to annex ideas of merit, honour, and happineſs—not to birth, dreſs, rank, beauty, fortune, power, popularity, and the like outward things,—but to moral and truly virtuous qualities, and to thoſe enjoyments which ſpring from a well-informed judgment, and a regular conduct of the affections, eſpecially thoſe of the ſocial and diſintereſted kind. Such dignified forms of beauty and good, often ſuggeſted, and, by moving pictures and examples, warmly recommended to the imagination, enforced by the authority of conſcience, and demonſtrated by reaſon to be the ſureſt means of enjoyment, and the only independent, undeprivable and durable goods, will be the beſt counter-balance to meaner paſſions, and the firmeſt foundation and ſecurity to virtue.

It is of great importance to the forming a juſt taſte, or pure and large conceptions of happineſs, to ſtudy and underſtand human nature well, to remember what a complicated ſyſtem it is, particularly to have deeply imprinted on our mind that gradation of ſenſes, faculties, and powers of enjoyment formerly mentioned, and the ſubordination of goods reſulting from thence, which nature points out, and the experience of mankind confirms; who, when they think ſeriouſly, and are not under the immediate influence of ſome violent prejudice or paſſion, prefer not the pleaſures of action, contemplation, ſociety, and moſt exerciſes and joys of the moral kind, as friendſhip, natural affection, and the like, to all ſenſual gratifications whatſoever? Where the different ſpecies of pleaſure are blended into one complex form, let them be accurately diſtinguiſhed, and be referred each to its proper faculty and ſenſe, and examined apart what they have peculiar, what common with others, and what foreign and adventitious. Let wealth, grandeur, luxury, love, fame, and the like, be tried by this teſt, and their true alloy will be found out.—Let it be farther conſidered, whether the mind may not be eaſy, and enjoy itſelf greatly, though it want many of thoſe elegancies and ſuperfluities of life which ſome poſſeſs, or that load of wealth and power which others eagerly purſue, and under which they groan. Let the difficulty of attaining, the precariouſneſs of poſſeſſing, and the many abatements in enjoying overgrown wealth and envied greatneſs, of which the weary poſſeſſors ſo frequently complain, as the hurry of buſineſs, the burden of company, of paying attendance to the few, and giving it to the many, the cares of keeping, the fears of loſing, and the deſires of increaſing what they have, and the other troubles which accompany this pitiful drudgery and pompous ſervitude; let theſe and the like circumſtances be often conſidered that are conducive to the removing or leſſening the opinion of ſuch goods, and the attendant paſſion or ſet of paſſions will decay of courſe.

Let the peculiar bent of our nature and character be obſerved, whether we are moſt inclined to form aſſociations and reliſh objects of the ſenſible, intellectual, or moral kind. Let that which has the aſcendant be particularly watched; let it be directed to right objects, be improved by proportioned exerciſes, and guarded by proper checks from an oppoſite quarter. Thus, the ſenſible turn

turn may be exalted by the intellectual and a taſte for the beauty of the fine arts, and both may be made ſubſervient to convey and rivet ſentiments highly moral and public-ſpirited. This inward ſurvey muſt extend to the ſtrength and weakneſſes of one's nature, one's condition, connections, habitudes, fortune, ſtudies, acquaintance, and the other circumſtances of one's life; from which every man will form the juſteſt eſtimate of his own diſpoſitions and character, and the beſt rules for correcting and improving them. And, in order to do this with more advantage, let thoſe times or critical ſeaſons be watched when the mind is beſt diſpoſed towards a change, and let them be improved by vigorous reſolutions, promiſes, or whatever elſe will engage the mind to perſevere in virtue. Let the conduct, in fine, be often reviewed, and the cauſes of its corruption or improvement be carefully obſerved.

It will greatly conduce to refine the moral taſte and ſtrengthen the virtuous temper, to accuſtom the mind to the frequent exerciſe of moral ſentiments and determinations, by reading hiſtory, poetry, particularly of the picturesque and dramatic kind, the ſtudy of the fine arts; by converſing with the moſt eminent for good-ſenſe and virtue; but, above all, by frequent and repeated acts of humanity, compaſſion, friendſhip, politeneſs, and hoſpitality. It is exerciſe gives health and ſtrength. He that reaſons moſt frequently, becomes the wiſeſt, and moſt enjoys the pleaſures of wiſdom. He who is moſt often affected by objects of compaſſion in poetry, hiſtory, or real life, will have his ſoul moſt open to pity and its delightful pains and duties. So he alſo who practiſes moſt diligently the offices of kindneſs and charity, will by it cultivate that diſpoſition, from whence all his pretenſions to perſonal merit muſt ariſe, his preſent and his future happineſs.

An uſeful and honourable employment in life will adminiſter a thouſand opportunities of this kind and greatly ſtrengthen a ſenſe of virtue and good affections, which muſt be nouriſhed by right training, as well as our underſtandings. For ſuch an employment, by enlarging one's experience, giving an habit of attention and caution, or obliging one, from neceſſity or intereſt, to keep a guard over the paſſions, and ſtudy the outward decencies and appearancies of virtue, will by degrees produce good habit, and at length inſinuate the love of virtue and honeſty for its own ſake.

It is a great inducement to the exerciſe of benevolence, to view human nature in a favourable light, to obſerve the characters and circumſtances of mankind on the faireſt ſides, to put the beſt conſtructions on their actions they will bear, and to conſider them as the reſult of partial and miſtaken, rather than ill affections, or, at worſt, as the exceſſes of a pardonable ſelf-love, ſeldom or never the effects of pure malice.

Above all, the nature and conſequences of virtue and vice, their conſequences being the law of our nature and will of heaven; the light in which they appear to our ſupreme Parent and Law-giver, and the reception they will meet with from him; muſt be often attended to. The exerciſes of piety, as adoration and praiſe of the Divine Excellency, invocation of and dependence on his aid, confeſſion, thankſgiving, and reſignation, are habitually to be indulged, and frequently performed, not only as medicinal, but highly improving to the temper.

To conclude: It will be of admirable efficacy towards eradicating bad habits, and implanting good ones, frequently to contemplate human life as the great nurſery of our future and immortal exiſtence, as that ſtate of probation in which we are to be educated for a divine life; to remember that our virtues or vices will be immortal as ourſelves, and influence our future as well as our preſent happineſs, and therefore that every diſpoſition and action is to be regarded as pointing beyond the preſent to an immortal duration. An habitual attention to this wide and important connection will give a vaſt compaſs and dignity to our ſentiments and actions, a noble ſuperiority to the pleaſures and pains of life, and a generous ambition to make our virtue as immortal as our being.

Motives to Virtue from perſonal Happineſs.

We have already conſidered our obligations to the practice of virtue, ariſing from the conſtitution of our nature, by which we are led to approve a certain order and œconomy of affections, and a certain courſe of action correſpondent to it.—But beſides this, there are ſeveral motives which ſtrengthen and ſecure virtue, though not themſelves of a moral kind. Theſe are, its tendemcy to perſonal happineſs, and the contrary tendeney of vice. "Perſonal happineſs ariſes, either from the ſtate of a man's own mind, or from the ſtate and diſpoſition of external cauſes towards him."

We ſhall firſt examine the "tendency of virtue to happineſs with reſpect to the ſtate of a man's own mind."—This is a point of the utmoſt conſequence in morals; becauſe, unleſs we can convince ourſelves, or ſhew to others, that, by doing our duty, or fulfilling our moral obligations, we conſult the greateſt ſatisfaction of our own mind, or our higheſt intereſt on the whole, it will raiſe ſtrong and often unſurmountable prejudices againſt the practice of virtue, eſpecially whenever there ariſes any appearance of oppoſition between our duty and our ſatisfaction or intereſt. To creatures ſo deſirous of happineſs and averſe to miſery as we are, and often ſo oddly ſituated amidſt contending paſſions and intereſts, it is neceſſary that virtue appear not only an honourable, but a pleaſing and beneficent form. And in order to juſtify our choice to ourſelves, as well as before others, we muſt ourſelves feel, and be able to avow in the face of the whole world, that her ways are ways of pleaſantneſs, and her paths the paths of peace. This will ſhew, beyond all contradiction, that we not only approve, but can give a ſufficient reaſon for what we do.

Let a man in a cool hour, when he is diſengaged from buſineſs, and undiſturbed by paſſion, as ſuch cool hours will ſometimes happen, ſit down, and ſeriouſly reflect with himſelf what ſtate or temper of mind he would chuſe to feel and indulge, in order to be eaſy and to enjoy himſelf. Would he chuſe, for that purpoſe, to be in a conſtant diſſipation and hurry of thought; to be diſturbed in the exerciſe of his reaſon; to have various, and often interfering phantoms of good playing before his imagination, ſoliciting and diſtracting him by turns, now ſoothing him with

with amusing hopes, then torturing him with anxious fears; and to approve this minute what he shall condemn the next? Would he chuse to have a strong and painful sense of every petty injury; quick apprehensions of every impending evil; incessant and insatiable desires of power, wealth, honour, pleasure; an irreconcileable antipathy against all competitors and rivals; insolent and tyrannical dispositions to all below him; fawning, and at the same time envious, dispositions to all above him; with dark suspicions and jealousies of every mortal? Would he chuse neither to love, nor to be beloved of any; to have no friend in whom to confide, or with whom to interchange his sentiments or designs; no favourite, on whom to bestow his kindness, or vent his passions; in fine, to be conscious of no merit with mankind, no esteem from any creature, no good affection to his Maker, no concerns for or hopes of his approbation; but, instead of all these, to hate, and know that he is hated, to contemn, and know that he is contemned by all; by the good because he is so unlike, and by the bad because he is so like themselves; to hate or to dread the very Being that made him; and, in short, to have his breast the seat of pride and passion, petulance and revenge, deep melancholy, cool malignity, and all the other furies that ever possessed and tortured mankind?—Would our calm inquirer after happiness pitch on such a state, and such a temper of mind, as the most likely means to put him in possession of his desired ease and self-enjoyment?

Or would he rather chuse a serene and easy flow of thought; a reason clear and composed; a judgment unbiassed by prejudice, and undistracted by passion; a sober and well-governed fancy, which presents the images of things true and unmixed with delusive and unnatural charms, and therefore administers no improper or dangerous fuel to the passions, but leaves the mind free to chuse or reject, as becomes a reasonable creature; a sweet and sedate temper, not easily ruffled by hopes or fears, prone neither to suspicion nor revenge, apt to view men and things in the fairest lights, and to bend gently to the humours of others rather than obstinately to contend with them? Would he chuse such moderation and continence of mind, as neither to be ambitious of power, fond of honours, covetous of wealth, nor a slave to pleasure; a mind of course neither elated with success, nor dejected with disappointment; such a modest and noble spirit as supports power without insolence, wears honours without pride, uses wealth without profusion or parsimony; and rejoices more in giving than in receiving pleasure; such fortitude and equanimity as rises above misfortunes, or turns them into blessings; such integrity and greatness of mind, as neither flatters the vices, nor triumphs over the follies of men; as equally spurns servitude and tyranny, and will neither engage in low designs, nor abet them in others? Would he chuse, in fine, such mildness and benignity of heart as takes part in all the joys, and refuses none of the sorrows of others; stands well affected to all mankind; is conscious of meriting the esteem of all, and of being beloved by the best; a mind which delights in doing good without any shew, and yet arrogates nothing on that account; rejoices in loving and being beloved by its Maker, acts ever under his eye, resigns itself to his providence, and triumphs in his approbation? Which of these dispositions would be his choice, in order to be contented, serene, and happy?—The former temper is *vice*, the latter *virtue*. Where one prevails, there misery prevails, and by the generality is acknowledged to prevail. Where the other reigns, there happiness reigns, and by the confession of mankind is acknowledged to reign. The perfection of either temper is misery, or happiness, in perfection. Therefore every approach to either extreme, is an approach to misery, or to happiness; that is to say, every degree of vice or virtue is accompanied with a proportionable degree of misery or happiness.

The principal alleviations of a virtuous man's calamities are these:—that, though some of them may have been the effect of his imprudence, or weakness; yet few of them are sharpened by a sense of guilt, and none of them by a consciousness of wickedness, which surely is their keenest sting:—that they are common to him with the best of men:—that they seldom or never attack him quite unprepared, but rather guarded with a consciousness of his own sincerity and virtue, with a faith and trust in providence, and a firm resignation to its perfect orders:—that they may be improved as means of correction, or materials to give scope and stability to his virtues:—and, to name no more, they are considerably lessened, and often sweetened to him, by the general sympathy of the wise and good.

His enjoyments are more numerous, or, if less numerous, yet more intense, than those of bad men: for he shares in the joys of others by rebound; and every increase of general or particular happiness is a real addition to his own. It is true, his friendly sympathy with others subjects him to some pains which the hard-hearted wretch does not feel; yet to give a loose to it, is a kind of agreeable discharge. It is such a sorrow as he loves to indulge; a sort of pleasing anguish, that sweetly melts the mind, and terminates in a self-approving joy. Tho' the good man may want means to execute, or be disappointed in the success of his benevolent purposes; yet he is still conscious of good affections; and that consciousness is an enjoyment of a more delightful savour than the greatest triumphs of successful vice. If the ambitious, covetous, or voluptuous, are disappointed, their passions recoil upon them with a fury proportioned to their opinion of the value of what they pursue, and their hope of success; while they have nothing within to balance the disappointment, unless it is an useful fund of pride, which however frequently turns mere accidents into mortifying affronts, and exalts grief into rage and frenzy. Whereas the meek, humble, and benevolent temper is its own immediate reward; is satisfied from within; and as it magnifies greatly the pleasure of success, so it wonderfully alleviates, and in a manner annihilates, all pain for the want of it.

As the good man is conscious of loving and wishing well to all mankind, he must be sensible of his deserving the esteem and goodwill of all; and this supposed reciprocation of social feelings, is, by the very frame of our nature, made a source of very intense and enlivening joys. By this sympathy of affections and interests he feels himself intimately united with the human race; and being

being ſenſibly alive over the whole ſyſtem, his heart receives and becomes reſponſive to every touch given to any part. So that he gathers contentment and delight from the pleaſed and happy ſtate of thoſe around him, from accounts and relations of ſuch happineſſes, from the very countenances, geſtures, voices, and ſounds even of creatures foreign to our kind, whoſe ſigns of joy and contentment he can any way diſcern.

Nor do thoſe generous affections ſtop any other natural ſource of joy whatever, or deaden his ſenſe of any innocent gratification. They rather keep the ſeveral ſenſes and powers of enjoyment open and diſengaged, intenſe, and uncorrupted by riot or abuſe; as is evident to any one who conſiders the diſſipated unfeeling ſtate of men of pleaſure, ambition, or intereſt, and compares it with the ſerene and gentle ſtate of a mind at peace with itſelf, and friendly to all mankind, unruffled by any violent emotion, and ſenſible to every good-natured and alluring joy.

It were eaſy, by going through the different ſets of affections, to ſhew, that it is only by maintaining the proportion ſettled there that the mind arrives at true repoſe and ſatisfaction. If fear exceeds that proportion, it ſinks into melancholy and dejection. If anger paſſes juſt bounds, it ferments into rage and revenge, or ſubſides into a ſullen corroding gloom, which embitters every good, and renders one exquiſitely ſenſible to every ill. The private paſſions, the love of honour eſpecially, whoſe impulſes are more generous as its effects are more diffuſive, are inſtruments of private pleaſure; but if they are diſproportioned to our wants, or to the value of the ſeveral objects, or to the balance of other paſſions equally neceſſary and more amiable, they become inſtruments of intenſe pain and miſery. For, being now deſtitute of that counterpoiſe which held them at a due pitch, they grow turbulent, peeviſh, and revengeful, the cauſe of conſtant reſtleſſneſs and torment, ſometimes flying out into a wild delirious joy, at other times ſettling into a deep ſplenetic grief. The concert between reaſon and paſſion is then broke: all is diſſonance and diſtraction within. The mind is out of frame, and feels an agony proportioned to the violence of the reigning paſſion.

The caſe is much the ſame, or rather worſe, when any of the particular kind affections are out of their natural order and proportion; as happens in the caſe of effeminate pity, exorbitant love, parental dotage, or any party paſſion, where the juſt regards to ſociety are ſupplanted. The more ſocial and diſintereſted the paſſion is, it breaks out into the wilder exceſſes, and makes the more dreadful havock, both within and abroad, as is but too apparent in thoſe caſes where a falſe ſpecies of religion, honour, zeal, or party-rage, has ſeized on the natural enthuſiaſm of the mind, and worked it up to madneſs. It breaks through all ties natural and civil, counteracts the moſt ſacred and ſolemn obligations, ſilences every other affection whether public or private, and transforms the moſt gentle natures into the moſt ſavage and inhuman.

Whereas the man who keeps the balance of affection even, is eaſy and ſerene in his motions; mild, and yet affectionate; uniform and conſiſtent with himſelf; is not liable to diſagreeable colliſions of intereſts and paſſions; gives always place to the moſt friendly and humane affections; and never to diſpoſitions or acts of reſentment, but on high occaſions, when the ſecurity of the private, or welfare of the public ſyſtem, or the great intereſts of mankind neceſſarily require a noble indignation; and even then he obſerves a juſt meaſure in wrath; and laſt of all, he proportions every paſſion to the value of the object he affects, or to the importance of the end he purſues.

To ſum up this part of the argument, the honeſt and good man has eminently the advantage of the knaviſh and ſelfiſh wretch in every reſpect. The pleaſures which the laſt enjoys flow chiefly from external advantages and gratifications; are ſuperficial and tranſitory; daſhed with long intervals of ſatiety, and frequent returns of remorſe and fear; dependent on favourable accidents and conjunctures; and ſubjected to the humours of men. But the good man is ſatisfied from himſelf; his principal poſſeſſions lie within, and therefore beyond the reach of the caprice of men or fortune; his enjoyments are exquiſite and permanent; accompanied with no inward checks to damp them, and always with ideas of dignity and ſelf-approbation; may be taſted at any time, and in any place. The gratifications of vice are turbulent and unnatural, generally ariſing from the relief of paſſions in themſelves intolerable, and iſſuing in tormenting reflections; often irritated by diſappointment, always inflamed by enjoyment, and yet ever cloyed with repetition. The pleaſures of virtue are calm and natural; flowing from the exerciſe of kind affections, or delightful reflections in conſequence of them; not only agreeable in the proſpect, but in the preſent feeling? they never ſatiate, or loſe their reliſh; nay, rather the admiration of virtue grows ſtronger every day; and not only is the deſire but the enjoyment heightened by every new gratification; and, unlike to moſt others, it is increaſed, not diminiſhed, by ſympathy and communication. In fine, the ſatisfactions of virtue may be purchaſed without a bribe, and poſſeſſed in the humbleſt as well as the moſt triumphant fortune; they can bear the ſtricteſt review, do not change with circumſtances, nor grow old with time. Force cannot rob, nor fraud cheat us of them; and, to crown all, inſtead of abating, they enhance every other pleaſure.

But the happy conſequences of virtue are ſeen, not only in the internal enjoyments it affords a man, but "in the favourable diſpoſition of external cauſes towards him, to which it contributes."

As virtue gives the ſober poſſeſſion of one's ſelf and the command of one's paſſions, the conſequence muſt be, heart's eaſe, and a fine natural flow of ſpirits, which conduce more than any thing elſe to health and long life. Violent paſſions, and the exceſſes they occaſion, gradually impair and wear down the machine. But the calm placid ſtate of a temperate mind, and the healthful exerciſes in which virtue engages her faithful votaries, preſerve the natural functions in full vigour and harmony, and exhilarate the ſpirits, which are the chief inſtruments of action.

It may by ſome be thought odd to aſſert, that virtue is no enemy to a man's fortune in the preſent ſtate of things.

things.—But if, by fortune, be meant a moderate or competent ſhare of wealth, power, or credit, not overgrown degrees of them, what ſhould hinder the virtuous man from obtaining that? He cannot cringe or fawn, it is true; but he can be civil and obliging as well as the knave; and ſurely, his civility is more alluring, becauſe it has more manlineſs and grace in it than the mean adulation of the other: he cannot cheat or undermine; but he may be cautious, provident, watchful of occaſions, and equally prompt with the rogue in improving them: he ſcorns to proſtitute himſelf as a pander to the paſſions, or as a tool to the vices of mankind; but he may have as ſound an underſtanding, and as good capacities for promoting their real intereſts, as the verieſt court-ſlave; and then, he is more faithful and true to thoſe who employ him. In the common courſe of buſineſs, he has the ſame chances with the knave of acquiring a fortune, and riſing in the world. He may have equal abilities, equal induſtry, equal attention to buſineſs; and in other reſpects he has greatly the advantage of him. People love better to deal with him; they can truſt him more; they know he will not impoſe on them, nor take advantage of them, and can depend more on his word than on the oath or ſtrongeſt ſecurities of others. Whereas what is commonly called cunning, which is the offspring of ignorance, and conſtant companion of knavery, is not only a mean-ſpirited, but a very ſhort-ſighted talent, and a fundamental obſtacle in the road of buſineſs. It may procure indeed immediate and petty gains; but it is attended with dreadful abatements, which do more than over-balance them, both as it ſinks a man's credit when diſcovered, and cramps that largeneſs of mind, which extends to the remoteſt as well as the neareſt intereſt, and takes in the moſt durable equally with the moſt tranſient gains. It is therefore eaſy to ſee how much a man's credit and reputation, and conſequently his ſucceſs, depend on his honeſty and virtue.

With regard to ſecurity and peace with his neighbours, it may be thought, perhaps, that the man of a quiet forgiving temper, and a flowing benevolence and courteſy, is much expoſed to injury and affronts from every proud or peeviſh mortal who has the power or will to do miſchief. If we ſuppoſe, indeed, this quietneſs and gentleneſs of nature accompanied with cowardice or puſillanimity, this may often be the caſe; but in reality, the good man is bold as a lion, and ſo much the bolder for being the calmer. Such a perſon will hardly be a butt to mankind. The ill-natured will be afraid to provoke him, and the good-natured will not incline to do it. Beſides, true virtue, which is conducted by reaſon, and exerted gracefully and without parade, is a moſt inſinuating and commanding thing; if it cannot diſarm malice and reſentment at once, it will wear them out by degrees, and ſubdue them at length. How many have, by favours, and prudently yielding, triumphed over an enemy who would have been inflamed into tenfold rage by the fierceſt oppoſition? In fine, goodneſs is the moſt univerſally popular thing that can be.

To conclude, the good man may have ſome enemies, but he will have more friends; and having given ſo many marks of private friendſhip or public virtue, he can hardly be deſtitute of a patron to protect, or a ſanctuary to entertain him, or to entertain or protect his children when he is gone. Though he ſhould have little elſe to leave them, he bequeaths them the faireſt, and generally the moſt unenvied, inheritance of a good name; which, like good ſeed ſown in the field of futurity, will often raiſe up unſolicited frineds, and yield a benevolent harveſt of unexpected charities. But ſhould the fragrance of the parent's virtue prove offenſive to a perverſe or envious age, or even draw perſecution on the friendleſs orphans, there is One in heaven, who will be more than a father to them, and recompence their parent's virtues by ſhowering down bleſſings on them.

Motives to Virtue from the BEING *and* PROVIDENCE *of* GOD.

BESIDES the intereſting motive mentioned in the laſt ſection, there are two great motives to virtue, ſtrictly connected with human life, and reſulting from the very conſtitution of the human mind. The firſt is the being and providence of God; the ſecond is the immortality of the ſoul, with future rewards and puniſhments.

It appears from what has been ſaid, that man, by the conſtitution of his nature, is deſigned to be a religious creature. He is intimately connected with the Deity, and neceſſarily dependent on him. From that connection and neceſſary dependence reſult various obligations and duties; without fulfilling which, ſome of his ſublimeſt powers and affections would be incomplete and abortive. If he be likewiſe an immortal creature, and if his preſent conduct ſhall affect his future happineſs in another ſtate as well as in the preſent; it is evident, that we take only a partial view of the creature if we leave out this important property of his nature, and make a partial eſtimate of human life if we ſtrike out of the account, or over-look, that part of his duration which runs out into eternity.

It is evident, that "to have a reſpect to the Deity in our temper and conduct, to venerate and love his character, to adore his goodneſs, to depend upon and reſign ourſelves to his providence, to ſeek his approbation, and act under a ſenſe of his authority, is a fundamental part of moral virtue, and the completion of the higheſt deſtination of our nature."

But as piety is an eſſential part of virtue, ſo likewiſe it is a great ſupport and enforcement to the practice of it. To contemplate and admire a being of ſuch tranſcendent dignity and perfection as God, muſt naturally and neceſſarily open and enlarge the mind, give a freedom and ampleneſs to its powers, and a grandeur and elevation to its aims. For, "the greatneſs of an object, and the excellency of the act of any agent about a tranſcendant object, doth mightily tend to the enlargement and improvement of his faculties." Little objects, mean company, mean cares, and mean buſineſs, cramp the mind, contract its views, and give it a creeping air and deportment. But when it ſoars above mortal cares and mortal purſuits into the regions of divinity, and converſes with the Greateſt and Beſt of Beings, it ſpreads itſelf into a wider compaſs, takes higher flights in reaſon and goodneſs, and becomes Godlike in its air and manners. Virtue is, if one may ſay ſo, both the effect and cause of largeneſs of mind. It

requires

requires that one think freely, and act nobly. Now, what can conduce more to freedom of thought and dignity of action, than to conceive worthily of God, to reverence and adore his unrivalled excellency, to imitate and transcribe that excellency into our own nature, to remember our relation to him, and that we are the image and representatives of his glory to the rest of the creation? Such feelings and exercises must and will make us scorn all actions that are base, unhandsome, or unworthy our state; and the relation we stand in to God will irradiate the mind with the light of wisdom, and ennoble it with the liberty and dominion of virtue.

The influence and efficacy of religion may be considered in another light. We all know that the presence of a friend, a neighbour, or any number of spectators, but especially an august assembly of them, uses to be a considerable check upon the coduct of one who is not lost to all sense of honour and shame, and contributes to restrain many irregular sallies of passion. In the same manner we may imagine, that the awe of some Superior Mind, who is supposed privy to our secret conduct, and armed with full power to reward or punish it, will impose a restraint on us in such actions as fall not under the controul or animadversion of others. If we go still higher, and suppose our inmost thoughts and darkest designs, as well as our most secret actions, to lie open to the notice of the Supreme and Universal Mind, who is both the spectator and judge of human actions; it is evident, that the belief of so august a presence, and such awful inspection, must carry a restraint and weight with it proportioned to the strength of that belief, and be an additional motive to the practice of many duties which would not have been performed without it.

It may be observed farther, that "to live under an habitual sense of the Deity and his great administration, is to be conversant with wisdom, order, and beauty, in the highest subjects, and to receive the delightful reflections and benign feelings which these excite, while they irradiate upon him from every scene of nature and providence." How improving must such views be to the mind, in dilating and exalting it above those puny interests and competitions which agitate and enflame the bulk of mankind against each other!—

Motive to Virtue from the Immortality of the Soul, &c.

The other motive mentioned was the immortality of the soul, with future rewards and punishments. The metaphysical proofs of the soul's immortality, are commonly drawn—from its simple, uncompounded, and indivisible nature; from whence it is concluded, that it cannot be corrupted or extinguished by a dissolution or destruction of parts:—from its having a beginning of motion within itself; whence it is inferred, that it cannot discontinue and lose its motion:—from the different properties of matter and mind; the sluggishness and inactivity of one, and the immense activity of the other; its prodigious flight of thought and imagination; its penetration, memory, foresight, and anticipations of futurity; from whence it is concluded, that a being of so divine a nature cannot be extinguished. But as these metaphysical proofs depend on intricate reasonings concerning the nature, properties, and distinction of body and mind, with which we are not very well acquainted, they are not obvious to ordinary understandings, and are seldom so convincing, even to those of higher reach, as not to leave some doubts behind them. Therefore, perhaps, it is not so safe to rest the proof of such an important article on what many may call the subtleties of school-learning. Those proofs which are brought from analogy, from the moral constitution and phenomena of the human mind, the moral attributes of God, and the present course of things, and which are therefore called the moral arguments, are the plainest, and generally the most satisfying. We shall select only one or two from the rest.

In tracing the nature and destination of any being, we form the surest judgment from his powers of action, and the scope and limits of these, compared with his state, or with that field in which they are exercised. If this being passes through different states or fields of action, and we find a succession of powers adapted to the different periods of his progress, we conclude that he was destined for those successive states, and reckon his nature progressive. If, besides the immediate set of powers which fit him for action in his present state, we observe another set which appears superfluous if he was to be confined to it, and which point to another or higher one, we naturally conclude, that he is not designed to remain in his present state, but to advance to that for which those supernumerary powers are adapted. Thus we argue, that the insect, which has wings forming or formed, and all the apparatus proper for flight, is not destined always to creep on the ground, or to continue in the torpid state of adhering to a wall, but is designed in its season to take its flight in air. Without this farther destination, the admirable mechanism of wings, and the other apparatus, would be useless and absurd. The same kind of reasoning may be applied to man, while he lives only a sort of vegetative life in the womb. He is furnished even there with a beautiful apparatus of organs, eyes, ears, and other delicate senses, which receive nourishment indeed, but are in a manner folded up, and have no proper exercise or use in their present confinement. Let us suppose some intelligent spectator, who never had any connection with man, nor the least acquaintance with human affairs, to see this odd phenomenon; a creature formed after such a manner, and placed in a situation apparently unsuitable to such various machinery; must he not be strangely puzzled about the use of his complicated structure, and reckon such a profusion of art and admirable workmanship lost on the subject; or reason, by way of anticipation, that a creature, endued with such various, yet unexerted capacities, was destined for a more enlarged sphere of action, in which those latent capacities shall have full play? The vast variety, and yet beautiful symmetry and proportions, of the several parts and organs with which the creature is endued, and their apt cohesion with, and dependence on, the curious receptacle of their life and nourishment, would forbid his concluding the whole to be the birth of chance, or the bungling effort of an unskilful artist, at least would make him demur a while at so harsh a sentence. But if, while he is in this state of uncertainty, we suppose him to see the babe, after a few successful struggles,

ſtruggles, throwing off his fetters, breaking looſe from his little dark priſon, and emerging into open day; then unfolding his recluſe and dormant powers, breathing in air, gazing at light, admitting colours, ſounds, and all the fair variety of nature; immediately his doubts clear up, the propriety and excellency of the workmanſhip dawn upon him with full luſtre, and the whole myſtery of the firſt period is unravelled by the opening of this new ſcene. Though in this ſecond period the creature lives chiefly a kind of animal life, *i. e.* of ſenſe and appetite; yet by various trials and obſervations he gains experience, and by the gradual evolution of the powers of imagination he ripens apace for an higher life, for exerciſing the arts of deſign and imitation, and of thoſe in which ſtrength or dexterity are more requiſite than acuteneſs or reach of judgment. In the ſucceeding rational or intellectual period, his underſtanding, which formerly crept in a lower, mounts into an higher ſphere, canvaſſes the natures, judges of the relations of things, forms ſchemes, deduces conſequences from what is paſt, and from preſent as well as paſt collects future events. By this ſucceſſion of ſtates, and of correſpondent culture, he grows up at length into a moral, ſocial, and a political creature. This is the laſt period, at which we perceive him to arrive in this his mortal career. Each period is introductory to the next ſucceeding one; each life is a field of exerciſe and improvement for the next higher one, the life of the fœtus for that of the infant, the life of the infant for that of the child, and all the lower for the higheſt and beſt.—But is this the laſt period of nature's progreſſion? Is this the utmoſt extent of her plot, where ſhe winds up the drama, and diſmiſſes the actor into eternal oblivion! Or does he appear to be inveſted with ſupernumerary powers, which have not full exerciſe and ſcope, even in the laſt ſcene, and reach not that maturity or perfection of which they are capable; and therefore point to ſome higher ſcene, where he is to ſuſtain another and more important character than he has yet ſuſtained? If any ſuch there are, may we not conclude by analogy, or in the ſame way of anticipation as before, that he is deſtined for that afterpart, and is to be produced upon a more auguſt and ſolemn ſtage, where his ſublimer powers ſhall have proportioned action, and its nature attain its completion?

If we attend to that curioſity, or prodigious thirſt of knowledge, which is natural to the mind in every period of its progreſs; and conſider withal the endleſs round of buſineſs and care, and the various hardſhips to which the bulk of mankind are chained down; it is evident, that in this preſent ſtate, it is impoſſible to expect the gratification of an appetite at once ſo inſatiable and ſo noble. Our ſenſes, the ordinary organs by which knowledge is let into the mind, are always imperfect, and often fallacious; the advantages of aſſiſting, or correcting them, are poſſeſſed by few; the difficulties of finding out truth amidſt the various and contradictory opinions, intereſts, and paſſions of mankind, are many; and the wants of the creature, and of thoſe with whom he is connected, numerous and urgent; ſo that it may be ſaid of moſt men, that their intellectual organs are as much ſhut up and ſecluded from proper nouriſhment and exerciſe in that little circle to which they are confined, as the bodily organs are in the womb. Nay, thoſe who to an aſpiring genius have added all the aſſiſtances of art, leiſure, and the moſt liberal education, what narrow proſpects can even they take of this unbounded ſcene of things from that little eminence on which they ſtand? And how eagerly do they ſtill graſp at new diſcoveries, without any ſatisfaction or limit to their ambition?

But ſhould it be ſaid, that man is made for action, and not for ſpeculation, or fruitleſs ſearches after knowledge; we aſk, For what kind of action? Is it only for bodily exerciſes; or for moral, political, and religious ones? Of all theſe he is capable: yet, by the unavoidable circumſtances of his lot, he is tied down to the former; and has hardly any leiſure to think of the latter; or, if he has, wants the proper inſtruments of exerting them. The love of virtue, of one's friends and country, the generous ſympathy with mankind, and heroic zeal of doing good, which are all ſo natural to great and good minds, and ſome traces of which are found in the loweſt, are ſeldom united with proportioned means or opportunities of exerciſing them; ſo that the moral ſpring, the noble energies and impulſes of the mind, can hardly find proper ſcope, even in the moſt fortunate condition; but are much depreſſed in ſome, and almoſt entirely reſtrained in the generality, by the numerous clogs of an indigent, ſickly, or embaraſſed life. Were ſuch mighty powers, ſuch Godlike affections planted in the human breaſt, to be folded up in the narrow womb of our preſent exiſtence, never to be produced into a more perfect life, nor to expatiate in the ample career of immortality?

Let it be conſidered, at the ſame time, that no poſſeſſion, no enjoyment within the round of mortal things, is commenſurate to the deſires, or adequate to the capacities of the mind. The moſt envied condition has its abatements; the happieſt conjuncture of fortune leaves many wiſhes behind; and after the higheſt gratifications, the mind is carried forward in purſuit of new ones without end. Add to all, the fond deſire of immortality, the ſecret dread of non-exiſtence, and the high unremitting pulſe of the ſoul beating for perfection, joined to the improbability or the impoſſibility of attaining it here; and then judge whether this elaborate ſtructure, this magnificient apparatus of inward powers and organs, does not plainly point out an hereafter, and intimate eternity to man? Does nature give the finiſhing touches to the leſſer and ignobler inſtances of her ſkill, and raiſe every other creature to the maturity and perfection of his being; and ſhall ſhe leave her principal workmanſhip unfiniſhed? Does ſhe carry the vegetative and animal life in man to their full vigour, and higheſt deſtination; and ſhall ſhe ſuffer his intellectual, his moral, his divine life to fade away, and be for ever extinguiſhed? Would ſuch abortions in the moral world be congruous to that perfection of wiſdom and goodneſs which upholds and adorns the natural?

We muſt therefore conclude, from this detail, that the preſent ſtate, even at its beſt, is only the womb of man's being, in which the nobleſt principles of his nature are in a manner fettered or ſecluded from a correſpondent ſphere of action; and therefore deſtined for a future and unbounded ſtate, where they ſhall emancipate themſelves, and

and exert the fulnefs of their ftrength. The moft accomplifhed mortal, in this low and dark appartment of nature, is only the rudiments of what he fhall be, when he takes his etherial flight, and puts on immortality. Without a reference to that ftate, man were a mere abortion, a rude unfinifhed embryo, a monfter in nature. But this being once fupoofed, he ftill maintains his rank, of the mafter-piece of the creation; his latent powers are all fuitable to the harmony and progreffion of nature; his noble afpirations, and the pains of his diffolution, are his efforts towards a fecond birth, the pangs of his delivery into light, liberty, and perfection; and death his difcharge from gaol, his feparation from his fellow-prifoners, and introduction into the affembly of thofe heroic fpirits who are gone before him, and of their great eternal Parent. The fetters of his mortal coil being loofened, and his prifon-walls broke down, he will be bare and open on every fide to the admiffion of truth and virtue, and their fair attendant happinefs; every vital and intellectual fpring will evolve itfelf, with a divine elafticity, in the free air of heaven. He will not then peep at the univerfe and its glorious Author through a dark grate, or a grofs medium, nor receive the reflections of his glory through the ftrait openings of fenfible organs; but will be all eye, all ear, all etherial and divine feeling.—Let one part, however, of the analogy be attended to; That, as in the womb we receive our original conftitution, form, and the effential ftamina of our being, which we carry along with us into the light, and which greatly affect the fucceeding periods of our life; fo our temper and condition in the future life will depend on the conduct we have obferved, and the character we have formed in the prefent life. We are here in miniature what we fhall be at full length hereafter. The firft rude fketch, or out-lines of reafon and virtue, muft be drawn at prefent, to be afterwards enlarged to the ftature and beauty of angels.

This, if duly attended to, muft prove not only a guard, but an admirable incentive to virtue. For he who faithfully and ardently follows the light of knowledge, and pants after higher improvements in virtue, will be wonderfully animated and inflamed in that purfuit, by a full conviction that the fcene does not clofe with life;—that his ftruggles arifing from the weaknefs of nature, and the ftrength of habit, will be turned into triumphs;—that his career in the tracts of wifdom and goodnefs will be both fwifter and fmoother;—and thofe generous ardors with which he glows towards heaven, *i. e.* the perfection and immortality of virtue, will find their adequate object and exercife in a fphere proportionably enlarged, incorruptible, immortal. On the other hand, what an inexpreffible damp muft it be to the good man, to dread the total extinction of that light and virtue, without which life, nay immortality itfelf, were not worth a fingle wifh?

Many writers draw their proofs of the immortality of the foul, and of a future ftate of rewards and punifhments, from the unequal diftribution of thefe here. It cannot be diffembled that wicked men often efcape the outward punifhment due to their crimes, and do not feel the inward in that meafure their demerit feems to require, partly from the calloufnefs induced upon their nature by the habits of vice, and partly from the diffipation of their minds abroad by pleafure or bufinefs; and fometimes good men do not reap all the natural and genuine fruits of their virtue, through the many unforfeen or unavoidable calamities in which they are involved. This, no doubt, upon the fuppofition of an all-wife and good Providence, were an argument, and a ftrong one too, for a future ftate, in which thofe inequalities fhall be corrected. But unlefs we fuppofe a prepollent good order in the prefent fcene of things, we weaken the proof of the divine adminiftration, and the prefumption of better order in any future period of it.

Virtue has prefent rewards, and vice prefent punifhments, annexed to it; fuch rewards and punifhments as make virtue, in moft cafes that happen, far more eligible than vice: but, in the infinite variety of human contingencies, it may fometimes fall out, that the inflexible practice of virtue fhall deprive a man of confiderable advantages to himfelf, his family, or friends, which he might gain by a well-timed piece of roguery, fuppofe by betraying his truft, voting againft his confcience, felling his country, or any other crime where the fecurity againft difcovery fhall heighten the temptation. Or, it may happen, that a ftrict adherence to his honour, to his religion, to the caufe of liberty and virtue, fhall expofe him, or his family, to the lofs of every thing, nay to poverty, flavery, death itfelf, or to torments far more intolerable. Now, what fhall fecure a man's virtue in circumftances of fuch trial? What fhall enforce the obligations of confcience againft the allurements of fo many interefts, the dread of fo many and fo terrible evils, and the almoft unfurmountable averfion of human nature to exceffive pain? The conflict is the greater, when the circumftances of the crime are fuch as eafily admit a variety of alleviations from neceffity, natural affection, love to one's family, or friends, perhaps in indigence: Thefe will give it even the air of virtue. Add to all, that the crime may be thought to have few bad confequences,—may be eafily concealed,—or imagined poffible to be retrieved in a good meafure by future good conduct. It is obvious to which fide moft men will lean in fuch a cafe, and how much need there is of a balance in the oppofite fcale, from the confideration of a God, of a provipence, and of an immortal ftate of retribution, to keep the mind firm and uncorrupt in thofe or like inftances of fingular trial or diftrefs.

But without fuppofing fuch peculiar inftances, a fenfe of a Governing Mind, and a perfuafion that virtue is not only befriended by him here, but will be crowned by him hereafter with rewards fuitable to its nature, vaft in themfelves, and immortal in their duration, muft be not only a mighty fupport and incentive to the practice of virtue, but a ftrong barrier againft vice. The thoughts of an almighty Judge, and of an impartial future reckoning, are often alarming, inexpreffibly fo, even to the ftouteft offenders. On the other hand, how fupporting muft it be to the good man, to think that he acts under the eye of his Friend, as well as Judge! How improving, to confider the prefent ftate as connected with a future one, and every relation in which he ftands as a fchool of dicipline for his affections, every trial as the exercife of fome virtue, and the virtuous deeds which refult from both as introductoty to higher fcenes of action and enjoyment! Finally, how tranfporting

tranſporting is it to view death as his diſcharge from the warfare of mortality, and a triumphant entry into a ſtare of freedom, ſecurity, and perfection; in which knowledge and wiſdom ſhall break upon him from every quarter; where each faculty ſhall have its proper object; and his virtue, which was often damped or defeated here, ſhall be enthroned in undiſturbed and eternal empire!

On reviewing this ſhort ſyſtem of morals, and the motives which ſupport and enforce it, and comparing both with the Chriſtian ſcheme, what light, and vigour do they borrow from thence! How clearly and fully does Chriſtianity lay open the connections of our nature, both material and immaterial, and future as well as preſent! What an ample and beautiful detail does it preſent of the duties we owe to God, to ſociety, and ourſelves; promulgated in the moſt ſimple, intelligible, and popular manner; diveſted of every partiality of ſect or nation; and adapted to the general ſtate of mankind! With what bright and alluring examples does it illuſtrate and recommend the practice of thoſe duties; and with what mighty ſanctions does it inforce that practice! How ſtrongly does it deſcribe the corruptions of our nature; the deviations of our life, from the rule of duty; and the cauſes of both! How marvellous and benevolent a plan of redemption does it unfold, by which thoſe corruptions may be remedied, and our nature reſtored from its deviations, to tranſcendent heights of virtue and piety! Finally, what a fair and comprehenſive proſpect does it give us of the adminiſtration of God, of which it repreſents the preſent ſtate only as a ſmall period; and a period of warfare and trial! How ſolemn and unbounded are the ſcenes which it opens beyond it; the reſurrection of the dead; the general judgment; the equal diſtribution of rewards and puniſhments to the good and the bad; and the full completion of divine wiſdom and goodneſs in the final eſtabliſhment of order, perfection, and happineſs!—How glorious then is that ſcheme of religion, and how worthy of affection as well as of admiration, which, by making ſuch diſcoveries, and affording ſuch aſſiſtances, has diſcloſed the unfading fruits and triumphs of virtue, and ſecured its intereſts beyond the power of time and chance!

M O R

MORAL SENSE, that whereby we perceive what is good, virtuous, and beautiful in actions, manners, and characters. See MORALS.

MORALITY. See MORAL PHILOSOPHY.

MORASS, a low, moiſt land, which receives the waters from the higher grounds without having any deſcent to carry them off.

MORAVIA, a marquiſate, or province in Bohemia, bounded by Sileſia on the north-eaſt, by Hungary and Auſtria on the ſouth, and by Bohemia on the north-weſt.

MORAVIANS, a ſect of Proteſtants, who have been ſettled for a conſidorable time paſt at Hernhuth in Germany, and have of late years ſpread themſelves over moſt of our American colonies, as well as in ſeveral parts of England, where they are permitted to ſettle by a late act of parliament. They have a kind of church-government peculiar to themſelves, and are commonly known by the name of *Unitas Fratrum*, or *The Brethren*. They profeſs the utmoſt veneration for our bleſſed Saviour, whom they conſider as their immediate Head and Director; enjoin the moſt implicit obedience to the rulers of their church; and are ſaid to practiſe much brotherly love amongſt one another.

MORBID, among phyſicians, ſignifies diſeaſed or corrupt; a term applied either to an unſound conſtitution, or to thoſe parts or humours that are infected by a diſeaſe.

MORDELLA, in zoology, a genus of the coleoptera claſs of inſects. The antennæ are thread-ſhaped, and ſerrated; the head is deflected under the neck; the pappi are clavated, compreſſed, and obliquely blunted; and the elytra are bent backwards near the apex. There are ſix ſpecies, all natives of different parts of Europe.

MOREA, the ancient Peloponneſus, is a province of European Turky, and is a peninſula about one hundred and eighty miles long, and one hundred and thirty broad, bounded by the gulphs of Lepanto and Engia on the north; by the Egean ſea, or Archipelago, on the eaſt; and by the Mediterranean on the ſouth and weſt.

MORESK, or MORISCO, is a kind of painting, carving, *&c.* done after the manner of the Moors; conſiſting of ſeveral groteſque pieces and compartments, promiſcuouſly mingled, not containing any perfect figure of a man, or other animal; but a wild reſemblance of birds, beaſts, trees, *&c.*

MORGAY, in ichthyology. See SQUALUS.

MORINA, in botany, a genus of the diandria monogynia claſs. The corolla is unequal; the calix of the fruit conſiſts of one dentated leaf; the calix of the flower is bifid; and there is but one ſeed under the flower-calix. There is but one ſpecies, a native of Perſia.

MORINDA, in botany, a genus of the pentandria monogynia claſs. The flowers are aggregate and monopetalous; the ſtigma is bifid; and the drupæ are aggregate. There are three ſpecies, none of them natives of Britain.

MORINELLUS, in ornithology. See CHARADRIUS.

MORISONA, a genus of the polyandria monogynia claſs. The corolla conſiſts of four petals, and the calix of two ſegments; the berry is hard, and contains one ſeed. There is but one ſpecies, a native of America.

MORLAIX, a port-town of France, in the province of Britany: W. long. 4°, N. lat. 48° 37′.

MORMYLUS, in ichthyology. See SPARUS.

MORNING, the beginning of the day, the firſt appearance of light, or the time from midnight till noon.

MOROCCO, the capital of the kingdom of the ſame name in Africa: W. long. 9°, N. lat. 32°.

MOROCHTHUS, in natural hiſtory, an indurated clay, called by us French chalk; ſerving taylors and others

to

to mark with. The ancients esteemed it as an astringent, prescribing it in the colic, hæmorrhages and other fluxes.

MORPETH, a borough-town of Northumberland, fourteen miles north of Newcastle, which sends two members to parliament.

MORTALITY, or *Bills of* MORTALITY, properly denote weekly lists of the persons who die in any place. See ANNUITIES.

Brief of MORTANCESTRY, in Scots law; anciently the ground of an action at the instance of an heir, in the special case where he had been excluded from the possession of his ancestor's estate by the superior or other person pretending right.

MORTAR, a preparation of lime and sand mixed up with water, which serves as a cement, and is used by masons and bricklayers in building of walls of stone and brick.

MORTAR-PIECE. See GUNNERY.

MORTGAGE, in law, a pledge or pawn of lands, tenements, *&c.* for money borrowed; so called, because if the money is not paid at the day, the land dies to the debtor, and is forfeited to the creditor.

MORTIER, an ensign of dignity, borne by the chancellor and grand presidents of the parliament of France. That borne by the chancellor, is a piece of cloth of gold, edged and turned up with ermine; and that of the first president is a piece of black velvet edged with a double row of gold lace, while that of the other presidents is only edged with a single row. This they formerly carried on their heads, as they do still in grand ceremonies, such as the entry of the king; but, ordinarily, they carry them in the hand.

MORTISE, or MORTOISE, in carpentry, *&c.* a kind of joint, wherein a hole of a certain depth is made in a piece of timber, which is to receive another piece called a tenon.

MORTMAIN, in law, is the alienation of lands or tenements to any religious house, corporation, or fraternity, and their successors.

MORTUARY, in the ecclesiastical law, is a gift left by a man at his death to his parish church, in recompence of personal tithes omitted to be paid in his lifetime: or it is that beast, or other cattle, which, after the death of the owner, by the custom of the place, is due to the parson or vicar, in lieu of tithes or offerings forgot, or not well and truly paid by him that is dead.

MORUS, in botany, a genus of the monœcia tetrandria class. The calix of the male has four segments; it has no corolla: The calix of the female consists of four leaves; it has no corolla: the styli are two, and the berry contains one seed. There are seven species, none of them natives of Britain.

MOSAIC, or MOSAIC-WORK, an assemblage of little pieces of glass, marble, precious stones, *&c.* of various colours, cut square, and cemented on a ground of stucco, in such a manner as to imitate the colours and degradations of painting.

Method of performing MOSAIC-WORK of glass is this: They provide little pieces of glass, of as many different colours and sizes as possible.

Now, in order to apply these several pieces, and out of them to form a picture, they in the first place procure a cartoon or design to be drawn; this is transferred to the ground or plaster by calking, as in painting in fresco. See FRESCO.

As this plaster is to be laid thick on the wall, and therefore will continue fresh and soft a considerable time, so that there may be enough prepared at once, to serve for as much work as will take up three or four days.

This plaster is composed of lime, made of hard stone, with brick dust very fine, gum tragacanth, and whites of eggs: when this plaster has been thus prepared and laid on the wall, and made the design of what is to be represented, they take out the little pieces of glass with a pair of plyers, and range them one after another, still keeping strictly to the light, shadow, different taints and colours represented in the design before; pressing or flatting them down with a ruler, which serves both to sink them within the ground, and to render the surface even.

Thus in a long time, and with a great deal of labour, they finish the work, which is still the more beautiful, as the pieces of glass are more uniform, and ranged at an even height.

Some of these pieces of mosaic-work are performed with that exactness, that they appear as smooth as a table of marble, and as finished and masterly as a painting in fresco; with this advantage, that they have a fine lustre, and will last ages

The finest works of this kind that have remained till our time, and those by whom the moderns have retrieved the art, which was in a manner lost, are those in the church of St Agnes, formerly the temple of Bacchus at Rome; and some at Pisa, Florence, and other cities of Italy. The most esteemed among the works of the moderns are those of Joseph Pine, and the chevalier Lanfranc in the church of St Peter at Rome: there are also very good ones at Venice.

Method of performing MOSAIC-WORK of marble and precious stones is this: The ground of mosaic-works, wholly marble, is usually a massive marble, either white or black. On this ground the design is cut with a chissel, after it has been first calqued. After it has been cut of a considerable depth, *i. e.* an inch or more, the cavities are filled up with marble of a proper colour, first fashioned according to the design, and reduced to the thickness of the indentures with various instruments. To make the pieces thus inserted into the indentures cleave fast, whose several colours are to imitate those of the design, they use a stucco, composed of lime and marble-dust; or a kind of mastic, which is prepared by each workman, after a different manner peculiar to himself.

The figures being marked out, the painter or sculptor himself draws with a pencil the colours of the figures, not determined by the ground, and in the same manner makes strokes or hatchings in the place, with

where ſhadows are to be: and after he has engraven with the chiſſel all the ſtrokes thus drawn, he fills them up with a black maſtic, compoſed partly of burgundy-pitch poured on hot; taking off afterwards what is ſuperfluous with a piece of ſoft ſtone or brick, which, together with water and beaten cement, takes away the maſtic, poliſhes the marble, and renders the whole ſo even that one would imagine it only conſiſted of one piece.

This is the kind of moſaic-work that is ſeen in the pompous church of the invalids at Paris, and the fine chaple at Verſailles, with which ſome entire apartments of that palace are incruſtated.

As for moſaic-work of precious ſtones, other and finer inſtruments are required than thoſe uſed in marble; as drills, wheels, *&c.* uſed by lapidaries and engravers on ſtone. As none but the richeſt marbles and ſtones enter this work, to make them go the farther, they are ſawn into the thinneſt leaves imaginable, ſcarce exceeding half a line in thickneſs; the block to be ſawn is faſtened firmly with cords on the bench, and only raiſed a little on a piece of wood, one or two inches high. Two iron pins, which are on one ſide the block, and which ſerve to faſten it, are put into a vice contrived for the purpoſe; and with a kind of ſaw or bow, made of fine braſs-wire, bent on a piece of ſpongy wood, together with emery ſteeped in water, the leaf is gradually faſhioned by following the ſtroke of the deſign, made on paper, and glued on the piece. When there are pieces enough faſtened to form an entire flower, or ſome other part of the deſign, they are applied to the ground.

The ground which ſupports this moſaic-work is uſually of free-ſtone. The matter with which the ſtones are joined together, is a maſtic, or kind of ſtucco, laid very thin on the leaves as they are faſhioned; and this being done, the leaves are applied with plyers.

If any contour, or ſide of a leaf, be not either ſquared or rounded ſufficiently, ſo as to fit the place exactly, into which it is to be inſerted, when it is too large, it is to be brought down with a braſs file or raſp; and if it be too little, it is managed with a drill and other inſtruments uſed by lapidaries.

Moſaic-work of marble is uſed in large works, as in pavements of churches, baſilics, and palaces; and in the incruſtation and vaneering of the walls of the ſame edifices.

As for that of precious ſtones, it is only uſed in ſmall works, as ornaments for altar-pieces, tables for rich cabinets, precious ſtones being ſo very dear.

Manner of performing MOSAIC WORK *of gypſum.* Of this ſtone calcined in a kiln, and beaten in a mortar, and ſifted, the French workmen make a ſort of artificial marbles, imitating precious ſtones; and of theſe they compoſe a kind of moſaic-work, which does not come far ſhort either of the durableneſs or the vivacity of the natural ſtones; and wich beſides has this advantage, that it admits of continued pieces or paintings of entire compartiments without any viſible joining.

Some make the ground of plaſter of Paris, others of free-ſtone. If it be of plaſter of Paris, they ſpread it in a wooden frame, of the length and breadth of the work intended, and in thickneſs about an inch and a half. This frame is ſo contrived, that the tenons being only joined to the mortiſes by ſingle pins, they may be taken aſunder, and the frame be diſmounted, when the plaſter is dry. The frame is covered on one ſide with a ſtrong linen cloth, nailed all round, which being placed horizontally with the linen at the bottom, is filled with plaſter paſſed through a wide ſieve. When the plaſter is half dry, the frame is ſet up perpendicularly, and left till it is quite dry; then it is taken out, by taking the frame to pieces.

In this moſaic, the ground is the moſt important part. Now in order to the preparation of this ſifted gypſum, which is to be applied on this ground, it is diſſolved and boiled in the beſt Engliſh glue, and mixed with the colour that it is to be of; then the whole is worked up together into the uſual conſiſtence of plaſter, and then is taken and ſpread on the ground five or ſix inches thick. If the work be ſuch, as that mouldings are required, they are formed with gouges and other inſtruments.

It is on this plaſter, thus coloured like marble or precious ſtone, and which is to ſerve as a ground to a work, either of lapis, agate, alabaſter, or the like, that the deſign to be repreſented is drawn; having been firſt pounced or calqued. To hollow or impreſs the deſign, they uſe the ſame inſtruments that ſculptors do; the ground whereon they are to work not being much leſs hard than the marble itſelf. The cavities being thus made in the ground, are filled with the ſame gypſum boiled in glue, only differently coloured, and thus are the different colours of the original repreſented. In order that the neceſſary colours and teints may be ready at hand, the quantities of the gypſum are tempered with the ſeveral colours in pots.

After the deſign has been thus filled and rendered viſible, by half-poliſhing it with brick and ſoft ſtone, they go over it again, cutting ſuch plates as are either to be weaker or more ſhadowed, and filling them with gypſum; which work they repeat, till all the colours being added one after the other, repreſent the original to the life.

When the work is finiſhed, they ſcour it with ſoft ſtone, ſand, and water; after that, with a pumice-ſtone; and in the laſt place poliſh it with a wooden mullet and emery. Then, laſtly, they give it a luſtre, by ſmearing it over with oil, and rubbing it a long time with the palm of the hand, which gives it a luſtre no ways inferior to that of natural marble.

MOSAMBIQUE, the capital of a province of the ſame name in Zanguebar, in Africa, ſituated on an iſland at the mouth of the river Moſambique: E. lon. 40°. S. lat. 15°.

MOSCHUS, a genus of quadrupeds of the order of pecora, having no horns; the canine teeth of the upper jaw are exerted. There are three ſpecies, *viz.* 1. The moſchiferus, or muſk animal, has a bag or pellicle near the navel, in which the perfume called muſk is contained.

This creature, when full grown, is three feet in length, from the tip of the noſe to the rump; the head is oblong, and the anterior part much like the greyhound; the ears are large and erect, they reſemble thoſe of the rabbit, and are equal in length to the diameter of the forehead; the tail is not more than two inches in length, and the creature always carries it erect; the body is tolerably fleſhy, and rounded; the legs about a foot in length, and very robuſt; the feet deeply divided, each into two claws in the anterior part, and as many heels behind. The fur on the head and that on the legs is about half an inch long, that on the belly is an inch and a half, and that which grows on the back three inches; theſe hairs are thicker than in any other known animal, and are variegated, from the baſe to the extremity, with diſtinct ſpaces of brown and white. The veſſel or bag in which the perfume called muſk is contained, is three inches long and two broad, and hangs under the belly, protuberating near three quarters of an inch beyond the ſurface. It is a native of Tartary.—2. The grimmia has a protuberant belt upon its head, and is found in Africa. 3. The pygmæus has feet narrower than a man's finger. It is found in Aſia and Guinea.

MOSCOW, the capital of the province of the ſame name in Muſcovy, ſituated on the river Moſcowa, 360 miles ſouth-eaſt of Peterſburg: E. long. 38°, N. lat. 55° 45′.

MOSCOWA, a river which riſes in the weſt part of the province of Moſcow, and falls into the river Ocka at Kolomna.

MOSELLE, a river of Germany, which riſes in the mountains of Vauge, in Lorrain, and, running thro' that duchy and the electorate of Triers, falls into the Rhine at Coblentz.

MOSKITO, a country of North America, ſituated between 85° and 88° of weſt longitude, and between 13° and 15° of north latitude; having the north ſea on the north and eaſt, Nicaragua on the ſouth, and Honduras on the weſt.

MOSPURG, or Mosburg, a town of Germany, in the circle of Bavaria, ſituated at the confluence of the rivers Iſer and Amburg, thirty miles north-eaſt of Munich.

MOSQUE, a temple, or place of religious worſhip, among the Mahometans.

All moſques are ſquare buildings, generally built with ſtone. Before the chief gate there is a ſquare court, paved with white marble; and low galleries round it, whoſe roof is ſupported by marble pillars. In theſe galleries the Turks waſh themſelves before they go into the moſque. In each moſque there is a great number of lamps; and between theſe hang many cryſtal rings, oſtriches eggs, and other curioſities, which when the lamps are lighted make a fine ſhew. As it is not lawful to enter the moſques with ſhoes or ſtockings on, the pavements are covered with pieces of ſtuff ſewed together, each being wide enough to hold a row of men kneeling, ſitting, or proſtrate. The women are not allowed to enter the moſque, but ſtay in the porches without. About every moſque there are ſix high towers, called minarets, each of which has three little open galleries, one above another: theſe towers, as well as the moſques, are covered with lead, and adorned with gilding and other ornaments; and from thence, inſtead of a bell, the people are called to prayers by certain officers appointed for that purpoſe. Moſt of the moſques have a kind of hoſpital belonging to them, in which travellers, of what religion ſoever, are entertained during three days. Each moſque has alſo a place called Tarbe, which is the burying-place of its founders; within which is a tomb ſix or ſeven feet long, covered with green velvet or ſattin; at the ends of which are two tapers, and round it ſeveral ſeats for thoſe who read the koran and pray for the ſouls of the deceaſed.

MOSS, in botany. See Muscus.

Moss is alſo a name given to boggy grounds in many parts of the kingdom. Theſe conſiſt of a turfy ſurface, below which is a black, moiſt, ſpongy earth, which being dug up with ſpades ſomewhat in the form of bricks, and dried, is what they call peats, uſed as fuel in ſeveral parts; and the upper ſcurf, being cut and dried, makes turfs, another coarſer ſort of fuel.

MOSTRA, in the Italian muſic, a mark at the end of a line or ſpace, to ſhew that the firſt note of the next line is in that place: and if this note be accompanied with a ſharp or flat, it is proper to place theſe characters along with the moſtra.

MOTACILLA, in ornithology, a genus of birds, of the order of the paſſeres, diſtinguiſhed by a ſtraight beak, of a ſubulated figure, and a lacerated tongue. There are 49 ſpecies belonging to this genus, moſt of which feed upon inſects, and migrate from the north to the ſouthern countries in order to procure ſubſiſtence in winter.

MOTE, in law-books, ſignifies court or convention; as a ward-mote, burgh-mote, ſwain-mote, *&c.*

MOTH, in zoology. See Phalæna.

MOTHER, a term of relation, denoting a woman who hath born a child.

MOTION, is defined to be the continued and ſucceſſive change of place. See Mechanics.

MOTTO, in armoury, a ſhort ſentence or phraſe carried in a ſcroll, generally under, but ſometimes over the arms; ſometimes alluding to the bearing, ſometimes to the name of the bearer, and ſometimes containing whatever pleaſes the fancy of the deviſer.

MOVEABLE, in general, denotes any thing capable of being moved.

Moveable *Subject*, in Scots law, any thing that moves itſelf, or can be moved; in contradiſtinction to immoveable or heretable ſubjects, as lands, houſes, *&c.* See Law, Tit. ix. 2.

MOVEMENT, in mechanics, a machine that is moved by clock-work. See Watch.

Perpetual Movement. Some have attempted to find a perpetual movement, but without ſucceſs; and there is reaſon to think, from the principles of mechanics, that ſuch a movement is impoſſible: for though in many caſes of bodies acting upon one another, there is a

gain of abſolute motion; yet the gain is always equal in oppoſite directions, ſo that the quantity of direct motion is never increaſed.

To make a perpetual movement it appears neceſſary, that a certain ſyſtem of bodies, of a determined number and quantity, ſhould move in a certain ſpace for ever, and in a certain way and manner: and for this there muſt be a ſeries of actions returning in a circle, otherwiſe the movement will not be perpetual; ſo that any action by which the abſolute quantity of force is increaſed, of which there are ſeveral ſorts, muſt have its correſponding counter-action, by which the gain of force is deſtroyed, and the quantity of force reſtored to its firſt ſtate.

Thus, by theſe actions, there will never be any gain of direct force, to overcome the friction and the reſiſtance of the medium; ſo that every motion being diminiſhed by theſe reſiſtances, they muſt at length languiſh and ceaſe.

MOULD, or Mold, in the mechanic arts, *&c.* a cavity cut with a deſign to give its form or impreſſion to ſome ſofter matter applied therein, of great uſe in ſculpture, foundery, *&c.*

Mould, in agriculture, a looſe kind of earth, every where obvious on the ſurface of the ground, called alſo natural or mother earth; by ſome alſo loam.

MOULDINESS, a term applied to bodies which corrupt in the air, from ſome hidden principle of humidity therein; and whoſe corruption ſhews itſelf by a certain white down, or lanugo, on their ſurface, which, viewed through a microſcope, appears like a kind of meadow, out of which ariſe herbs and flowers, ſome only in the bud, others full blown, and others decayed, each having its root, ſtalk, and other parts.

MOULDING, any thing caſt in a mould, or that ſeems to have been ſo, though in reality it were cut with a chiſſel, or the ax.

Mouldings, in architecture, projectures beyond the naked wall, column, wainſcot, *&c.* the aſſemblage of which forms corniches, door-caſes, and other decorations of architecture. See Architecture.

MOULINET, is uſed, in mechanics, to ſignify a roller, which being croſſed with two levers, is uſually applied to cranes, capſtans, and other ſorts of engines of the like nature, to draw ropes, and heave up ſtones, *&c.*

Moulinet is alſo a kind of turnſtile, or wooden croſs, which turns horizontally upon a ſtake fixed in the ground; uſually placed in paſſages to keep out horſes, and to oblige paſſengers to go and come one by one. Theſe moulinets are often ſet near the outworks of fortified places at the ſides of the barriers, through which people paſs on foot.

MOUND, a term uſed for a bank or rampart, or other fence, particularly that of earth.

Mound, in heraldry, a ball or globe with a croſs upon it, ſuch as our kings are uſually drawn with, holding it in their left hand, as they do the ſceptre in the right.

MOUNT, an elevation of earth, called alſo mountain. See Mountain.

Mount St Michael, a borough-town of Cornwal, ſituated on a bay of the Engliſh channel, called Mountſ-bay, eighteen miles weſt of Falmouth.

It ſends two members to parliament.

Mount sorrel, a market town of Leiceſterſhire, ſeven miles north of Leiceſter.

Mount *of Piety*, certain funds or eſtabliſhments in Italy, where money is lent out, on ſome ſmall ſecurity. We had alſo mounts of piety in England, raiſed by contribution for the benefit of people ruined by the extortions of the Jews.

MOUNTAIN, a part of the earth, riſing to a conſiderable height above the level of the ſurface thereof.

MOUSE, in zoology. See Mus.

Mouse-ear, in botany. See Hierachium.

Mouse-tail. See Myosurus.

Dor-Mouse. See Sorex.

Sea-Mouse. See Aphrodita.

MOUSEL, or Mosul, a city of Aſiatic Turky, in the province of Diarbec, or Meſopotamia, ſituated on the river Tigris, oppoſite the place where Nineveh ſtood; E. long. 43°, and N. lat. 36°.

MOUTH, in anatomy. See Anatomy, p. 299.

Mouth is uſed in the courts of princes, for what relates to their eating and drinking: Hence officers of the mouth, yeomen of the mouth.

MSCYSLAW, the capital of the palatinate of Mſcyſlaw in Poland, ſituated on the frontiers of Muſcovy: E. long. 31° 30′, and N. lat. 54° 34′.

MUCILAGE, in pharmacy, is in general any viſcid and glutinous liquor.

Mucilage alſo imports the liquor which principally ſerves to moiſten the ligaments and cartilages of the articulations; and is ſupplied by the mucilaginous glands.

MUCOR, in botany, a genus of the cryptogamia fungi claſs. It conſiſts of ſmall bladders, containing numerous ſeeds. There are twelve ſpecies, ſeven of them natives of Britain.

MUCRO cordis, in anatomy, the lower or pointed end of the heart.

MUCUS, a mucilaginous liquor ſeparated by the mucous glands and the noſtrils. See Anatomy.

MUER, a town of Germany, in the circle of Auſtria, and duchy of Stiria, ſituated on the river Muer, twenty-five miles north weſt of Gruz.

MUFFLE, in Chemiſtry. See Chemistry, p. 109.

MUFTI, the chief of the eccleſiaſtical order, or primate of the muſſelman religion. The authority of the mufti is very great in the Ottoman empire; for even the ſultan himſelf, if he would preſerve any appearance of religion, cannot, without hearing his opinion, put any perſon to death, or ſo much as inflict any corporal puniſhment. In all actions, eſpecially criminal ones, his opinion is required, by giving him a writing, in which the caſe is ſtated, under feigned names; which he ſubſcribes with the words, *He ſhall*, or *ſhall not be puniſhed.* Such outward honour is paid to the mufti, that the grand ſeignior himſelf riſes up to him, and advances ſeven ſteps to meet him, when he comes into his preſence. He alone has the honour of kiſſing the ſultan's left ſhoulder, whilſt the prime vizier kiſſes only

only the hem of his garment. When the grand ſeignior addreſſes any writing to the mufti, he gives him the following titles, "To the eſad, the wiſeſt of the wiſe, inſtructed in all knowledge, the moſt excellent of excellents, abſtaining from things unlawful, the ſpring of virtue and true ſcience, heir of the prophetic doctrines, reſolver of the problems of faith, revealer of the orthodox articles, key of the treaſures of truth, the light to the doubtful allegories, ſtrengthened with the grace of the ſupreme legiſlator of mankind, may the moſt high God perpetuate thy virtues." The election of the mufti is ſolely in the grand ſeignior, who preſents him with a veſt of rich ſables, *&c.* If he is convicted of treaſon, or any great crime, he is put into a mortar, kept for that purpoſe in the Seven Towers at Conſtantinople, and pounded to death.

MUGGLETONIANS, a religious ſect which aroſe in England, about the year 1657; ſo denominated from their leader Lodowick Muggleton, a journeyman taylor, who, with his aſſociate Reeves, ſet up for great prophets, pretending, as it is ſaid, to have an abſolute power of ſaving and damning whom they pleaſed; and giving out that they were the two laſt witneſſes of God that ſhould appear before the end of the world.

MUGIL, in ichthyology, a genus of fiſhes belonging to the order of abdominales. The lips are membranaceous, the inferior one being carinated inwards; they have no teeth; the branchioſtege membrane has ſeven crooked rays; the opercula are ſmooth and round; and the body is of a whitiſh colour. There are two ſpecies diſtinguiſhed by the number of rays in the back-fin.

MUG-WORT, in botany. See ARTEMISIA.

MUID, a large meaſure, in uſe among the French, for things dry. The muid is no real veſſel uſed as a meaſure, but an eſtimation of ſeveral other meaſures, as the ſeptier, mine, minot, buſhel, *&c.*

MUID, is alſo one of the nine caſks, or regular veſſels uſed in France, to put wine and other liquors in. The muid of wine is divided into two demi-muids, four quarter-muids, and eight half-quarter-muids, containing 36 ſeptiers.

MULL, one of the weſtern iſlands of Scotland, being part of the ſhire of Argyle, and lying to the weſtward of it: this iſland is twenty-four miles long, and in ſome places as many broad.

MULL *of Cantire*, the ſouth cape or promontory of the county of Cantire or Mul, in the frith of Clyde, on the weſt of Scotland.

MULL *of Galloway*, the ſouth cape or promontory of all Scotland, in the county of Galloway, on the Iriſh ſea.

MULATTO, a name given in the Indies to thoſe who are begotten by a negro man on an Indian woman, or an Indian man on a negro woman.

MULBERRY, in botany. See MORUS.

MULCT, a fine of money laid upon a man who has committed ſome fault or miſdemeanor.

MULDAW, a river of Bohemia, that ariſes on the confines of Auſtria, and running north, through Bohemia, unites with the Elbe at Melnick.

MULE, in zoology, a mongrel kind of quadruped, uſually generated between an aſs and a mare, and ſometimes between a horſe and a ſhe-aſs.

MULLERAS, a town of Germany, in the circle of Upper Saxony, and marquiſate of Brandenburg, ſituated thirty-eight miles ſouth-eaſt of Berlin.

MULLET, in ichthyology. See MUGIL.

MULLET, or MOLLET, in heraldry, a bearing in form of a ſtar, or rather of the rowel of a ſpur, which it originally repreſented.

The mullet has but five points; when there are ſix it is called a ſtar; though others make this difference, that the mullet is, or ought to be, always pierced, which a ſtar is not. See plate CVI. The mullet is uſually the difference or diſtinguiſhing mark for the fourth ſon, or third brother, or houſe; though it is often borne alone, as coat armour.

MULSUM, a liquor made of wine and honey, or even of wine and water.

MULTAN, or MOUTAN, a city of hither India in Aſia, capital of the province of Multan, ſituated on the river Indus. E. long. 72° 15′, N. lat. 30°.

MULTIPLE, in arithmetic, a number which comprehends ſome other ſeveral times, thus 6 is a multiple of 2, and 12 is a multiple of 6, 4, and 3, comprehending the firſt twice, the ſecond thrice, *&c.*

Action of MULTIPLEPOINDING, in Scots law. See LAW, Tit. xxx. 24.

MULTIPLICAND, in arithmetic. See ARITHMETIC, p. 371.

MULTIPLICATION, in general, the act of increaſing the number of any thing.

Multiplication in arithmetic, is a rule by which any given number may be ſpeedily increaſed, according to any propoſed number of times. See ARITHMETIC, p. 371.

MULTIPLICATION, in algebra. See ALGEBRA, p. 81.

MULTIPLICATOR, or MULTIPLIER, in arithmetic. See ARITHMETIC, p. 371.

MULTIPLYING GLASS, in optics, one wherein objects appear increaſed in number. See OPTICS.

MULTURE, in Scots law, the quantity of grain paid to the proprietor or tackſman of a mill for grinding. See LAW, Tit. xvi. 12.

MULVIA, a river of Barbary, in Africa, which riſes in the mountains of Atlas, and divides the empire of Morocco from the kingdom of Algiers, and then falls into the Mediterranean, weſt of Marſalquiver.

MUM, a kind of malt-liquor, much drank in Germany; and chiefly brought from Brunſwick, which is the place of moſt note for making it. The proceſs of brewing mum, as recorded in the town-houſe of that city, is as follows: Take ſixty-three gallons of water that has been boiled till one third part is conſumed, and brew it with ſeven buſhels of wheaten malt, one buſhel of oat-meal, and one buſhel of ground beans; when it is tunned, the hogſhead muſt not be filled too full at firſt: as ſoon as it begins to work, put into it three pounds of the inner rind of fir, one pound of the tops of fir and beech, three handfuls of carduus benedictus, a handful or two of the flower of roſa ſolis; add burnet,

betony,

betony, marjoram, avens, penny-royal, and wild thyme, of each a handful and a half; of elder-flowers, two handfuls or more; ſeeds of cardamum bruiſed, thirty ounces; barberries bruiſed, one ounce; when the liquor has worked a while, put the herbs and ſeeds into the veſſel; and, after they are added, let it work over as little as poſſible; then fill it up: laſtly, when it is ſtopped, put into the hogſhead ten new-laid eggs unbroken; ſtop it up cloſe, and drink it at two years end. Our Engliſh brewers, inſtead of the inner rind of fir, uſe cardamum, ginger, and ſaſſafras; and alſo add elecampane, madder, and red ſanders. Mum, on being imported, pays for every barrel 1 l. 5 s.

MUMMY, a body embalmed or dried, in the manner uſed by the ancient Egyptians; or the compoſition with which it is embalmed. There are two kinds of bodies denominated mummies: the firſt are only carcaſes dried by the heat of the ſun, and by that means kept from putrefaction: Theſe are frequently found in the ſands of Lybia. Some imagine, that theſe are the bodies of deceaſed people buried there on purpoſe to keep them entire without embalming; others think they are the carcaſes of travellers, who have been overwhelmed by the clouds of ſand raiſed by the hurricanes frequent in thoſe deſarts. The ſecond kind of mummies are bodies taken out of the catacombs near Cairo, in which the Egyptians depoſited their dead after embalming.

We have two different ſubſtances preſerved for medicinal uſe under the name of mummy, though both in ſome degree of the ſame origin. The one is the dried and preſerved fleſh of human bodies, embalmed with myrrh and ſpices; the other is the liquor running from ſuch mummies, when newly prepared, or when affected by great heat or damps. The latter is ſometimes in a liquid, ſometimes of a ſolid form, as it is preſerved in vials well ſtopped, or ſuffered to dry and harden in the air. The firſt kind of mummy is brought to us in large pieces, of a lax and friable texture, light and ſpungy, of a blackiſh brown colour, and often damp and clammy on the ſurface: it is of a ſtrong but diſagreeable ſmell. The ſecond kind of mummy, in its liquid ſtate, is a thick, opake, and viſcous fluid, of a blackiſh colour, but not diſagreeable ſmell. In its indurated ſtate, it is a dry ſolid ſubſtance, of a fine ſhining black colour, and cloſe texture, eaſily broken, and of a good ſmell; very inflammable, and yielding a ſcent of myrrh and aromatic ingredients while burning. This, if we cannot be content without medicines from our own bodies, ought to be the mummy uſed in the ſhops; but it is very ſcarce and dear; while the other is ſo cheap, that it will always be moſt in uſe.

All theſe kinds of mummy are brought from Egypt. But we are not to imagine, that any body breaks up the real Egyptian mummies, to ſell them in pieces to the druggiſts, as they may make a much better market of them in Europe whole, when they can contrive to get them. What our druggiſts are ſupplied with, is the fleſh of executed criminals, or of any other bodies the Jews can get, who fill them with the common bitumen ſo plentiful in that part of the world; and adding a little aloes, and tw[illegible] ſend them to be baked i[illegible] exhaled, and the embalming m[illegible] thoroughly that the fleſh will keep and bear tranſporting into Europe. Mummy has been eſteemed reſolvent and balſamic: but whatever virtues have been attributed to it, ſeem to be ſuch as depend more upon the ingredients uſed in preparing the fleſh, than in the fleſh itſelf; and it would ſurely be better to give thoſe ingredients without ſo ſhocking an addition.

Mummy, among gardeners, a kind of wax uſed in grafting and planting the roots of trees, made in the following manner: Take one pound of black pitch, and a quarter of a pound of turpentine; put them together into an earthen pot, and ſet them on fire in the open air, holding ſomething in your hand to cover and quench the mixture in time, which is to be alternately lighted and quenched till all the nitrous and volatile parts be evaporated. To this a little common wax is to be added; and the compoſition is then to be ſet by for uſe.

MUNGATS, or Munkats, a town of upper Hungary: E. long. 22°, N. lat. 48° 30′.

MUNICH, a large and elegant city, the capital of the electorate and dutchy of Bavaria ſituated on the river Iſer: E. long. 11° 32′, N. lat. 48° 5′.

MUNICIPAL, in the Roman civil law, an epithet which ſignifies inveſted with the rights and privileges of Roman citizens. Thus the municipal cities were thoſe whoſe inhabitants were capable of enjoying civil offices in the city of Rome: Theſe cities, however, according to Mariana, had fewer privileges than the colonies: They had no ſuffrages or votes at Rome; but were left to be governed by their own laws and magiſtrates. Some few municipal cities, however, obtained the liberty of votes.

Municipal, among us, is applied to the laws that obtain in any particular city or province. And thoſe are called municipal officers who are elected to defend the intereſt of cities, to maintain their rights and privileges, and to preſerve order and harmony among the citizens; ſuch as mayors, ſheriffs, conſuls, &c.

MUNITION, the proviſions with which a place is furniſhed in order for defence; or that which follows a camp for its ſubſiſtence.

MUNSTER, the capital of the biſhoprick of the ſame name, and of the circle of Weſtphalia, ſituated on the river Aa: E. long. 7° 10′, N. lat. 52°.

Munster, is alſo a town of Germany, in the Landgraviate of Alſatia, ſubject to France: E. long. 7° 5′, N. lat. 48° [illegible].

Munster meinfelt, a town of Germany, in the circle of the lower Rhine, and electorate of Triers: E. long. 7°, N. lat. 50° 15′.

MUNSTERBERG, the capital of the duchy of the ſame name in Sileſia: E. long. 16°, N. lat. 50° 35′.

MUNTINGIA, in botany, a genus of the polyandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; and the berry has one cell containing many ſeeds. There is but one ſpecies, a native of America.

...logy, a genus of fishes ...es. The head is smooth; ... the membrane of the gills; the eyes are covered with a common skin; and the body is cylindrical, and slimy. There are seven species, distinguished by their fins, tail, &c.

MURCIA, the capital of the province of the same name in Spain: W. long. 1° 12′, N. lat. 38° 6′.

MURDER, or MURTHER, in law, is the wilful and felonious killing a person from premeditated malice; provided the party wounded, or otherwise hurt, die within a year and a day after the fact was committed. See LAW, Tit. xxxiii.

MURDERERS, or MURDERING-PIECES, in a ship, are small pieces of ordnance, either of brass or iron, which have chambers put in at their breeches. They are used at the bulk-heads of the fore-castle, half-deck, or steerage, in order to clear the deck, on the ship's being boarded by an enemy.

MURENGERS, two officers of great antiquity in the city of Chester, annually chosen out of the aldermen, to see that the walls are kept in repair, and to receive a certain toll and custom for the maintenance thereof.

MUREX, in zoology, a genus of insects belonging to the order of vermes testacea. This animal is of the snail kind; the shell consists of one spiral valve, rough with membranaceous furrows; and the aperture terminates in an entire canal either streight or somewhat ascending. There are 60 species, particularly distinguished by peculiarities in their shells, &c.

MURIA, ALIMENTARY SALT. See SALT.

MURO, a town of Italy, in the kingdom of Naples, sixty miles south-east of the city of Naples.

MURRAIN, or GARGLE, a contagious disease among cattle.

The symptoms of this disease are a hanging down and swelling of the head, abundance of gum in the eyes, rattling in the throat, a short breath, palpitation at the heart, staggering, a hot breath, and a shining tongue.

In order to prevent this disease, the cattle should stand cool in summer, have plenty of good water; all carrion should be speedily buried; and as the feeding of cattle in wet places, on rotten grass and hay, often occasions this disease, dry and sweet fodder should be given them.

MURRAY, a county of Scotland, bounded by the German Sea, on the north; by Banff, on the east; by Mar and Badenoch, on the south; and by Inverness, on the west.

MURREY, in heraldry, a kind of purple colour. See SANGUINE.

MUS, in zoology, a genus of quadrupeds, belonging to the order of glires; the generic character of which is, that the fore-teeth of the lower jaws are subulated. There are 21 species. 1. The porcellus, or guiney-pig, has no tail; there are four toes on the fore-feet, and three on the hind ones. This animal makes a grunting noise, is very restless, and stamps with its hind-feet when teazed. It loves heat, and feeds upon various vegetables. The female has two dugs. The colour is very various. It is a native of Brasil. 2. The aguti has a short tail, four toes on the fore-feet, three on the hind ones, and a yellowish belly. It is a native of Brasil, Surinam, and Guinea. 3. The leporinus has the same characters with the former, only the belly is white. It is found in Java and Sumatra. 4. The citellus has a short tail, an ash-coloured body, and no ears. It is found in Bohemia, &c. below ground. 5. The lemmus, has a short tail, five toes on both fore and hind-feet, and the body is variegated with green and yellow. They are found in the Lapland mountains under little hillocks, and feed solely on vegetables. 6. The paca, has a short tail, five toes on each foot, and there are three yellowish lines on each side. It is a native of Brasil. 7. The marmota has a short hairy tail, round ears, and gibbous cheeks. It digs deep holes in the earth with amazing quickness; sleeps profoundly during the winter; lifts its food to its mouth with the fore-feet; often sits erect; it is easily tamed, and is found in Switzerland. 8. The monax has a hairy tail, an ash coloured body, roundish ears, and four toes on the fore feet and five on the hind ones. It is a native of America. 9. The cricetus has a tail of a moderate length, round ears, a black belly, and reddish sides, with three white spots. This animal digs deep caverns in the earth, divided into many different cells in which it deposites and preserves large quantities of fruits and grains. The female brings forth six young ones twice in the year, each of which lives in a separate cell. They are hunted for food, for their skins, and even for the quantity of grain found in their cells. It is a native of Germany. 10. The terrestris has a hairy tail, with four toes on the fore-feet, and five on the hind ones, and ears shorter than the hair. This animal, which is about half the size of a rat, digs in the gardens like a mole, and eats the bark off the roots of trees, &c. It swims in ditches, and devours young ducks in the ponds. It is a native of Europe. 11. The amphibious has a long hairy tail, with palmated feet. It digs in the banks of ditches and under the roots of trees, and feeds upon vegetables. It is found both in Europe and Africa. 12. The rattus, or rat, has a long naked tail, four toes on the fore-feet, and five on the hind ones, and a claw on the large toe. This animal infests the houses every where through Europe, and is devoured by cats and other animals of the same class. It is reported by several authors, that rats were originally transported from America in a ship belonging to Antwerp. 13. The musculus, or common mouse, has a long naked tail, four toes on the fore-feet and five on the hind ones, but has no claw on the large toe. This animal is a native of Europe, feeds upon grain and flesh of all kinds. 14. The avellanarius has a long hairy tail, a reddish body, a white throat, and the hind toes have no claws. It frequents the woods of Europe, feeds upon nuts, which it lays up in the earth, and sleeps during winter. 15. The quercinus has a long hairy tail, with a black ring under the eyes. It is a native of the south of Europe. 16. The gregarius has a tail about one third of the length of its body, and somewhat hairy; the body is of a greyish colour, and the legs are white.

It is a native of Germany. 17. The sylvaticus has a tail of a middling length, four toes on the fore feet, and five on the hind ones; the body is grey, interspersed with black hairs, and the belly is white. It is found in the gardens and woods of Europe. 18. The striatus has four toes on the fore-feet, and five on the hind ones; it has longitudinal streaks on the body, with white spots. It is a native of India. 19. The longipes has a long covered tail, four toes on the fore feet, five on the hind ones, and very long thighs. It is found in the torrid zone. 20. The jaculus has a long fleecy tail, with very long thighs, and short fore-legs. It walks on its hind-feet only, and has a jumping motion. It is found in Arabia, Egypt, &c. 21. The volans has a long hairy tail, four toes on the fore feet and five on the hind ones, and the skin from the ears to the tail is extended like wings, by which it is enabled to fly. It is a native of Virginia and Mexico.

MUSA, the PLAINTAIN-TREE, in botany, a genus of the polygamia monœcia class. The calix is a spatha: the corolla consists of two petals; one of them straight and teethed; and the other is concave, short, and furnished with a nectarium. It has six filaments, and one stylus. There are four species, all natives of the Indies.

MUSCA, in zoology, a genus of insects belonging to the order of diptera. The mouth is furnished with a fleshy proboscis, and two lateral lips; it has no pappi. There are 129 species, principally distinguished by peculiarities in their feelers.

MUSCADINE, a rich kind of wine, of the growth of Provence and Languedoc, in France.

MUSCLE, in anatomy. See ANATOMY, p. 192.

MUSCLE, in natural history. See MYTULUS.

MUSEUM, a name which originally signified a part of the palace of Alexandria, which took up at least one fourth of that city. This quarter was called the Museum, from its being set apart for the muses and the study of the sciences. Here were lodged and entertained the men of learning; who were divided into many companies or colleges, according to the sciences of which they were the professors; and to each of these houses or colleges was allotted a handsome revenue. The foundation of this establishment is attributed to Ptolemy Philadelphus, who here placed his library. Hence the word Museum is now applied to any place set apart as a repository for things that have an immediate relation to the arts.

The Museum at Oxford, called the Ashmolean Museum, is a noble pile of building, erected at the expence of the university, at the west end of the theatre, at which side it has a magnificent portal, sustained by pillars of the Corinthian order. The front, which is to the street, extends about sixty feet, where there is this inscription over the entrance, in gilt characters, *Museum Ashmoleanum, schola naturalis historiæ, officina chymica.*

It was begun in 1679, and finished in 1683, when a valuable collection of curiosities was presented to the university by Elias Ashmole, Esq. which were the same day reposited there. And several accessions have been since made to the Museum; among which are hieroglyphics and other Egyptian antiquities, an entire mummy, Roman antiquities, altars, medals, lamps, &c. and a variety of natural curiosities.

The British Museum in London is a large, beautiful, and magnificent building, and the noblest cabinet of curiosities in the world. This edifice was erected in 1677, and was called Montague-house, from having been the town residence of the dukes of Montague. In the year 1753, the British parliament having passed an act for purchasing the Museum of the late Sir Hans Sloan, and the collection of manuscripts of the late lord Oxford, called the Harleian Library, for the use of the public; 26 trustees were appointed and incorporated, to provide a repository for those and some other collections, which repository was to be called the British Museum. These trustees elected fifteen other trustees; and having bought Montague-house, fitted it up for the reception of these collections: they also appointed officers to superintend the museum; and having ordained certain statutes with respect to viewing the collection contained in it, the public were admitted to view it in 1757.

MUSES, certain fabulous divinities amongst the pagans, supposed to preside over the arts and sciences: for this reason it is usual for the poets, at the beginning of a poem, to invoke these goddesses to their aid. Some reckon the muses to be no more than three, *viz.* Mneme, Aœde, and Melete; that is, memory, singing, and meditation: but the most ancient authors, and particularly Homer and Hesiod, reckon nine; *viz.* Clio, which means glory; Euterpe, pleasing; Thalia, flourishing; Melpomene, attracting; Terpsichore, rejoicing the heart; Erato, the amiable; Polyhymnia, a multitude of songs; Urania, the heavenly; and Calliope, sweetness of voice. To Clio, they attributed the invention of history; to Melpomene, tragedy; to Thalia, comedy; to Euterpe, the use of the flute; to Terpsichore, the harp; and to Erato, the lyre and lute; to Calliope, heroic verse; to Urania, astrology: and to Polyhymnia, rhetoric.

MUSHROOM, in botany. See FUNGUS.

M U S I C K.

MUSICK is one of the seven sciences commonly called liberal; and is comprehended also among the mathematical, as having for its object discrete quantity or number, but not considering it in the abstract like arithmetick, but in relation to time and sound, in order to make a delightful harmony: Or it is the art of

disposing,

diſpoſing and conducting ſounds conſidered as acute and grave; and proportioning them among themſelves, and ſeparating them by juſt intervals pleaſing to the ſenſe.

Mr Malcome defines it a ſcience that teaches how ſound, under certain meaſures of time and tune, may be produced; and ſo ordered and diſpoſed, as either in conſonance (*i. e.* joint-ſounding,) or ſucceſſion, or both, they may raiſe agreeable ſenſations.

From this definition, the ſcience naturally divides into two general parts, *viz.* theoretical and practical.

PART I. The THEORY of MUSICK.

Chap. I. Of MUSICAL SOUNDS.

Axiom I. The ear is the ſole judge of ſound. Every ſound is not a muſical ſound. For to this two things are required: firſt, That the ſound pleaſe the ear; ſecondly, That it be within a certain compaſs. A muſical ſound is clear, uninterrupted, and uniform; and ought not to exceed the power of the ear to judge of it.

For ſounds, very deep or very high, are not eaſily diſtinguiſhed, but by an ear very converſant in muſick.

Sound being a ſimple idea, cannot be defined but by an imperfect deſcription of its cauſe; which is an undulatory motion of the air, communicated by the vibration of the parts of bodies to the organ of hearing.

The diverſities of ſounds, and their proportions, are perfectly diſcerned by the ear, are the object of the theory of muſick, the grounds and principles of the practice, as well as the cauſes of pleaſure in the ſenſe and imagination.

Theſe diverſities of ſounds are expreſſed by the terms high and low, acute and grave, or ſharp and flate. Hence, from any given ſound, we can conceive a ſucceſſion of them; wherein the laſt in order is more acute than the foregoing; and this ſeries is called notes aſcending.

Or, on the contrary, when, in a ſucceſſion of ſounds, the laſt in order is more grave than the former; this ſeries is called notes deſcending.

Axiom II. From this order of notes aſcending and deſcending are deduced all the proportions of ſounds; the properties of the ſame proportions; and the relations which ariſe out of their various combinations and ſucceſſions. Theſe include the whole buſineſs of harmony and melody; and the knowledge of them is the ground work or baſis of the ſcience of muſick.

Corollary I. Hence nothing can be admitted in muſical compoſition which doth not immediately depend on the foregoing axiom, and which cannot be demonſtrated from it.

Sect. 2. *Of the* Diversity *of* Sounds.

The diverſity of ſounds ſucceeding in the natural order is not however extended through any number of ſounds which may be expreſſed by a muſical inſtrument, or even by the human voice. For univerſal experience, conducted by the judgment of the ear, hath demonſtrated and aſcertained the number ſeven to comprehend all the variety that muſick is capable of affording. Therefore, the number eight is the bound or limit of the materials of muſical compoſition; and this eighth note or ſound is called an octave.

This octave may be conceived as unity, or the firſt note of another ſeries aſcending or deſcending.

This ſeries, though it may be repeated at pleaſure, muſt ſtill come under the reſtriction above mentioned; which is, that it muſt not exceed the power of the ear to judge of it. The greateſt compaſs of the human voice will ſcarcely reach above two octaves, or fifteen notes. Inſtruments are framed with more, to anſwer the moſt intereſting purpoſe of muſick, which is variety.

The ſeven ſounds in muſic are named from the firſt ſeven letters of the alphabet, viz. A,B,C,D,E,F,G.

The diſtance between any two of thoſe, whether immediate or remote, is called an interval. And every interval is named from the natural numbers; beginning at unity.

In naming of an interval, it is alway underſtood of the aſcending notes; and both terms are incluſive. Thus AB is called a 2d, AE a 5th, BE a 4th, EG a 3d, AA an 8th or octave; and ſo of the reſt.

We proceed now to lay down an exact deſcription of all the intervals in muſic. For from the knowledge of theſe are diſcovered all the proportions which conſtitute harmony; and upon which the whole ſuperſtructure of muſick is raiſed.

Firſt, of the intervals of ſounds lying in their natural order. Of theſe there are ſeven intervals, named either the greater tone, the leſſer tone, and the half-tone or ſemitone. *See the Muſick Plates*, N°. 1, 2.

Interval of a

N°. 1.	Major	Minor	Semitone	Major	Minor	Major	Semitone

Interval of a

N°. 2.	Major	Semitone	Minor	Major	Semitone	Minor	Major

In this ſeries of 8 notes are contained 5 whole tones; three greater, and two leſſer; and 2 ſemitones. Reducing them therefore to the loweſt denomination, they will be found to contain 12 half-tones; and incluſively 13. Every octave then contains 13 half tones; out of the various combinations of which ariſe the ſeveral concords and diſcords, as will be ſhewn in its proper place. The leſſer tones are alike divided into half tones, as are the greater. We ſhall therefore, for brevity ſake, hereafter uſe the diſtinction only of whole tones and half tones: the reaſon for which ſhall be aſſigned below.

From the inequality in the order of theſe intervals we draw the following corollary.

Cor-

Cor. II. Harmonical proportion is of a ſpecies different from all other proportions, and can be demonſtrated only from principles peculiar to itſelf. This will be ſeen when we come to ſhew the method of dividing a line harmonically; as well as from the proportion ſtated in numbers.

The firſt of the notes in the examples above is called the key-note, or key. Notwithſtanding the intervals may be reckoned from any given note; yet it will anſwer our purpoſe better to begin with the key.

In the firſt example,

The firſt interval, or diſtance between the key and ſecond, contains 2

Between the 2d and 3d	2	
3d and 4th	1	
4th and 5th	2	Semitones.
5th and 6th	2	
6th and 7th	2	
7th and 8th	1	

In the ſecond example,

The firſt interval, or diſtance between the key and ſecond, contains 2 ſemitones.

Between the 2d and 3d	1	
3d and 4th	2	
4th and 5th	2	Semitones.
5th and 6th	1	
6th and 7th	2	
7th and 8th	2	

From this compariſon of the two ſeries, it is evident there is but one difference, and this ariſing from the order of the notes, or place of the ſemitone, For if you begin to read the ſecond ſeries at the interval between the 3d and 4th, the ſemitones will be found exactly in the ſame order as in the firſt example.

In the firſt example, the firſt ſemitone falls on the 4th note, or that which is next above the 3d to the key; which 3d is 5 half tones above the key incluſively. In the 2d example, the half-tone falls on the 3d note; and is therefore itſelf the third to the key, and is four half-tones above the key incluſively.

This diſtinction of the place of the ſemitone is moſt worthy of obſervation, it being the only eſſential difference of tune, the ground-work of all that beautiful variety which may be introduced in the air or melody, as well as it is the principle or hinge on which turns the reſolution of every diſcord. The key-note of every tune is that whereon the tune ends; which though it may be altered for variety in the upper part, yet the laſt note of the baſs is ever the key.

When the 3d to the key is 5 ſemitones to the key, as in the firſt example, that tune is ſaid to be compoſed in a ſharp key. When the 3d to the key is 4 ſemitones to the key, as in the ſecond example, the tune is in a flat key. And this, as was ſaid before, is the only difference in tune.

This diſtinction of flat and ſharp third holds good, not only in relation to the key, but likewiſe to every note in the ſcale of muſick. And in this light it is the foundation of compoſing in different keys; of changing the key in the ſame tune which introduces the ſo much deſired variety in muſick; and of writing the ſame tune in divers keys, which is called tranſpoſition. Hence we eſtabliſh the following axioms.

Axiom III. As the difference of the flat and ſharp third to the key conſtitutes the key, and is eſſential to the tune: ſo no tune compoſed in a ſharp key can be compoſed into a flat one, nor a flat into a ſharp; for that would be altering the permanent nature of things.

The truth of this axiom will moſt evidently appear, when we ſhall, in the ſecond part, or practice, have learned the art of tranſpoſition.

Axiom IV. The great and conſtant object which muſt be ſought after in muſick, whether in compoſition, or performance of thorough baſs, is variety with uniformity. For the proportions already laid down, and the prodigious variety emerging from them, as they lie in the order of nature, before they are modified, divided or combined by art, do not only point out this variety to us; but the concords and diſcords likewiſe made out of theſe, and arranged by art, will not only not ſuffer us to recede from the eſtabliſhed precept, but by a kind of ſweet violence conſtrain us to purſue this darling object.

On the truth of this axiom is grounded the reaſon for the mixture of diſcord with harmony, and the occaſion of this precept in playing thorough baſs, namely, that the hands ſhould as much as poſſible move in a contrary direction.

As to the place of the other ſemitone, which in the flat key is on the 6th, the reaſon ſhall be told in its proper place. And moreover, it muſt be obſerved, that the greater 7th in the ſharp key, which cauſes the ſecond ſemitone to fall on the 8th in that key, is alſo common to the flat key in many paſſages, but unexceptionably at the end of the tune, or cloſe.

Sect. 3. *Of the* Concords *and* Discords.

Of the intervals ſtanding in their natural order are compounded the greater intervals, namely, the concords and diſcords.

Theſe are the next things to be conſidered. Now, to inveſtigate the order of theſe, and their proportions to each other, we muſt have recourſe to the original cauſe of ſound; that is, to the tremulous motion of the air, excited by the percuſſion of ſome ſolid body, as a bell, ſtring, or pipe.

This trembling of the air is in proportion quick or ſlow as the impreſſion given it by the voice or an inſtrument. The quicker the trembling is, the more acute the ſound; the ſlower, the more grave or flat. The ſame ſound is the effect of the ſame degree of quickneſs of the air's motion continued. Hence a ſtring ſounding the ſame note to the end of its vibration, proves, that the vibrations are in equal times, from the greateſt to the leaſt ranges of its motion.

The ſhorter a muſical ſtring is, the quicker are its vibrations, and therefore the more acute the ſound.

The longer a ſtring is, the more ſlow are its vibrations, and ſo the more grave the ſound.

Therefore, from the diviſion of a muſical ſtring, the proportions of acuteneſs or gravity are computed. Hence we raiſe the following axiom.

Axiom V. The quickneſs of the vibrations is reci-

procal to the lengths. Thus in two strings of the same matter, and equal diameters; if one be double the length of the other, it will give half the quickness of pulses; that is, half the number of pulses in the same time: or, the lengths being as 2 to 1, the vibrations are as 1 to 2. On this axiom are demonstrated the order and proportions of the concords, as follows.

Proportion of the Octave.

C

A————————————————B

Let AB, a musical string, be divided equally in C, and stopt there: CB will sound an octave to the whole or open string AB. Now, CB, AB, are as 1 to 2: therefore, the vibrations are as 2 to 1; that is, the proportion of the octave or diapason is double, or 2 to 1. Q. E. D.

Proportion of the 5th.

C

A————————————————B

Let AB be divided into three equal parts, and stopt in C: CB will sound a 5th to the whole or open string. Now, CB is to AB as 2 to 3: therefore the vibrations are as 3 to 2; that is, the proportion of the 5th, or diapente, is sesquialteral, or 3 to 2.

Proportion of the 4th.

C

A————————————————B

Let the string be stopt in C, which is a 4th part of the whole: CB will sound a 4th to the whole AB or open string. Now, CB is to AB as 3 to 4: therefore the vibrations are as 4 to 3; or, the proportion of the 4th, or diatessaron, is 4 to 3.

Proportion of the sharp 3d.

C

A————————————————B

Stop the string in C, the 5th part: CB will sound a greater 3d to AB. But CB is to AB as 4 to 5. Therefore the vibrations are as 5 to 4; or, the proportion of the sharp 3d is as 5 to 4.

Proportion of the flat 3d.

C

A————————————————B

Stop in C the 6th part: CB will sound the lesser or flat third. But, &c. Therefore the proportion of the flat third is as 6 to 5.

Proportion of the greater or sharp 6th.

C

A————————————————B

CB $\frac{3}{5}$ths of AB will sound the greater 6th. Therefore the proportion of the sharp 6th, is as 5 to 3.

Proportion of the lesser or flat 6th.

C

A————————————————B

CB, $\frac{5}{8}$ths of AB, sounds the lesser 6th. Therefore the proportion of the flat 6th is as 8 to 5.

If these divisions of the string, whose numerators are the same, or unity, be set down in fractions, in the natural order of numbers, thus $\frac{1}{2}\frac{1}{3}\frac{1}{4}\frac{1}{5}$, &c. and reduced to a common denominator, the harmonical proportions will appear in the same succession of concords, as investigated by sound in the division of the same line; and the numerators, being by this reduction as whole numbers, will stand thus, 60, 40, 30, 24, &c. For the common denominator, 120, answering to the whole or open string; the relative proportion of the same to the first fraction, and the relative proportion between each two successive fractions, will express the proportion of the harmonic chords. Thus $\frac{120}{60}$ $\frac{2}{1}$ or 8th. $\frac{60}{40}$ $\frac{3}{2}$ or 5th. $\frac{40}{30}$ $\frac{4}{3}$ or 4th. $\frac{30}{24}$ $\frac{5}{4}$ or sharp 3d. Hence we discover relative harmonical proportion in numbers: which is, As the first is to the third; so is the difference of the first and second to the difference of the second and third. For, reducing the first three numbers to the lowest terms, and inverting, they will be 2, 3, 6. Now 2:6::1:3. Again, reducing the second three, they will be 3, 4, 6. Now 3:6::1:2. Wherever this proportion obtains, the numbers bear harmonical or musical relation. Further, the rectangle, or quotient of the first and third numbers multiplied, being divided by the excess of twice the first above the second, finds a fourth proportional. Thus 3, 4, 6, given as above; 3 multiplied by 6, gives 18: which divided by 2, the excess of twice 3, the first above 4 the second, gives 9, the fourth musical proportional. Thus 3, 4, 6, 9: And of these, the first is to the fourth, as the difference of the first and second is to the difference of the third and 4th. So 3:9::1:3.

The harmonic proportion of three numbers in this natural succession of fractions, extends as far as the chord of the flat 3d. Which third, being $\frac{1}{6}$ of the whole number, limits this equality of proportion, seeing that the number 7 is no aliquot part. But as to the fourth proportional, it cannot be found even from that number which expresses the sharp 3d, which is still of shorter extent. This limitation of proportion then explains the extent of harmony, and likewise becomes the principle of the same; as will be seen in the definition of harmony.

Hence it is evident, the remaining concords of the sharp 6th, which is $\frac{5}{3}$, and of the flat 6th, or $\frac{8}{5}$, are not included in this equality of proportion.

These are the concords, their order and proportions; any one of which sounded together with the open string, is concordant with it, and produces harmony.

Example of the names and order of the intervals in concord with the open string or bass, and the semitones contained in each, *Musick Plates*, No. 3.

Again, two of these concordant intervals, namely, the

5th and —— 8th

Sharp 3d and —— 8th

Flat

Flat 3d and —— 8th
Sharp 3d and —— 5th
Flat 3d and —— 5th
Sharp 3d and Sharp 6th
Flat 3d and Flat 6th
6th and —— 4th
Flat 6th and —— 4th

ſounded with the open ſtring, or baſs note, are concordant all together; and therefore produce harmony.

Example of two concording with the open ſtring or baſs. No 4.

Next follows an example of three concording with the baſs. No. 5.

Having thus diſcovered the concords, their order and proportions; it is worth remarking, that the firſt concord, or 8th, which ariſes from the moſt ſimple diviſion of a line, is the moſt perfect concord; the 5th is the next perfect concord; and ſo of the reſt, in the order they have been found by the diviſion of the ſtring. For the nature and perfection of the 4th, accounted by ſome a very imperfect concord, ſhall be explained in the corollaries of the demonſtration of the harmony, in Part II. on practice.

The 8ths and 5ths then are called the perfect concords. The 3ds and 6ths imperfect concords. The 4th, of a middle nature between the others, may be called an improper concord; for this reaſon, that with the 6th, with which it is always accompanied in harmony, though it make perfect harmony with the given note, yet they change the chord into that of the 4th to that note.

Likewiſe the 6th, whether joined with the 3d or 4th to the given note, tho' it make perfect harmony with either, yet they change the chord into that of the 6th or 4th to the ſame note.

Hence the reaſon why the 6ths are more imperfect concords than the 3ds.

From the order and perfection of the concords thus diſcovered; we deduce the following corollary.

Cor. III. The moſt perfect harmony is that which will be produced by the perfect concords, namely, the 3d, 5th, and 8th. Thus No. 6.

From the foregoing corollary, we are able to give a juſt definition of harmony. Harmony conſiſts in one certain invariable proportion of diſtance of four ſounds performed at the ſame inſtant of time, and moſt pleaſing to the ear.

Theſe proportions of the firſt ſeries are called ſimple concords. If the notes of a ſecond ſeries be added to the firſt octave, the proportion of any two concording notes compounded with the octave retains the name and nature of the ſimple concord; as a tenth, compounded of an octave and third, is called a third; a twelfth, compounded of an octave and 5th, is called a fifth; a fifteenth, compounded of two octaves, is called an octave, or double octave. And ſo on to a third ſeries.

Theſe are the compound concords.

All other proportions ſounded together are harſh and diſagreeable to the ear; and are for this reaſon called diſcords.

From the compounding and dividing the proportions delivered, not only the harmonical intervals are computed, but the diſcords likewiſe.

And this the following calculations demonſtrate.

The proportion of the octave is the proportion of the 4th and 5th: for, by compounding $\frac{4}{3}\,\frac{3}{2}=\frac{12}{6}$, or $\frac{2}{1}$ the proportion of the octave.

Again, it is the proportion of the ſharp 3d and flat 6th: for, $\frac{5}{4}\,\frac{8}{5}\,\frac{40}{20}=\frac{20}{10}\,\frac{10}{5}\,\frac{2}{1}$ in its loweſt terms.

Again, the flat 3d and ſharp 6th: for, $\frac{6}{5}\,\frac{5}{3}=\frac{30}{15}$ or $\frac{2}{1}$ the proportion of the octave.

Now, ſince the 4th and 5th, the 3d and 6th, as alſo the 2d and 7th, compounded, make the octave; that is, any two numbers making 9, the middle term or note being repeated, or common to both; it follows, that to fall a 4th or riſe a 5th, as alſo to fall a 3d or riſe a 6th, and to fall a 2d or riſe a 7th, and the contrary, anſwers the ſame purpoſe of harmony; for they meet in the octave.

This obſervation will be of great uſe in ſetting the baſs, and figuring the ſame, by producing that variety and contrary motion demonſtrated neceſſary in the 4th axiom.

Proportion of the 5th.

The proportion of the 5th is the proportion of the ſharp 3d and flat 3d; for by compounding $\frac{5}{4}\,\frac{6}{5}=\frac{30}{20}$ or $\frac{3}{2}$ the ſeſquialteral and known proportion of the 5th.

Proportion of the Sharp 6th.

The proportion of the ſharp 6th is the compound proportions of the fourth and ſharp 3d; for $\frac{4}{3}\,\frac{5}{4}=\frac{20}{12}$, or $\frac{5}{3}$. Of the flat 6th, the proportion is of the 4th and flat 3d; for $\frac{4}{3}\,\frac{6}{5}=\frac{24}{15}$ or $\frac{8}{5}$.

By the ſame manner of compounding are found the proportions of the concords of the 3ds; which ſhall be ſhewn when we ſhall have got the tones and ſemitones; which, as being diſcords, ariſe by dividing the harmonic proportions as follows.

Proportions *of the* Discords *proved.*

Proportion of the Greater Tone.

The proportion of the greater tone is the difference of the 4th and 5th; for $\frac{4}{3})\,\frac{3}{2}\,(=\frac{9}{8}$ the proportion of the greater tone.

Proportion of the Leſſer Tone.

The proportion of the leſſer tone is the difference of the 5th and ſharp 6th; for $\frac{3}{2})\,\frac{5}{3}=\frac{10}{9}$ the proportion of the leſſer tone.

Proportion of the Semitone.

The proportion of the ſemitone is the difference of the ſharp 3d and 4th; for $\frac{5}{4})\,\frac{4}{3}=\frac{16}{15}$ the proportion of the ſemitone.

Having now the propprtions of the tones and ſemitones, we are enabled to prove the proportion of the ſemitone, or flat 2d and ſharp 7th to the 8th; as likewiſe all the remaining proportions, whether diſcord or concord: For, the 5th and ſharp 3d, $\frac{3}{2}.\frac{5}{4}$, give $\frac{15}{8}$ the greater 7th; and the ſharp 9th and ſemitone $\frac{15}{8}\,\frac{16}{15}=\frac{240}{120}$ in its loweſt terms $\frac{2}{1}$ the proportion of the octave.

To go on; The proportion of the ſharp 3d is that of the greater

greater and lesser tones; for, $\frac{9}{8}\,\frac{10}{9}$ — $\frac{90}{72}\,\frac{30}{24}\,\frac{15}{12}\,\frac{9}{4}$ in its lowest terms, the greater 3d.

And the proportion of the flat 3d is compounded of the greater tone and semitone; for, $\frac{9}{8}\,\frac{16}{15}$ — $\frac{144}{120}\,\frac{48}{40}$ in its lowest terms $\frac{6}{5}$ the proportion of the flat 3d.

The proportion of the 4th is that of the sharp 3d and semitone; for, $\frac{5}{4}\,\frac{16}{15}$ — $\frac{80}{60}$ in its lowest terms the proportion $\frac{4}{3}$ of the 4th. Or it is the proportions of the flat 3d and lesser tone; for, $\frac{6}{5}\,\frac{10}{9}$ — $\frac{60}{45}\,\frac{12}{9}$ in its lowest terms $\frac{4}{3}$.

The proportion of the discord of the sharp 4th is found by compounding its constituent intervals, the 4th and semitone; for, $\frac{4}{3}\,\frac{16}{15}$ — $\frac{64}{45}$ the proportion of the sharp 4th.

And lastly, the proportion of the flat 7th is compounded of two 4ths, or is $\frac{16}{9}$; for, $\frac{4}{3}\,\frac{4}{3}$ — $\frac{16}{9}$ the proportion of the flat 7th.

These proportions, in the natural order of the first series, or sharp key, stand thus:

K	2d	Sharp 3d	4th	5th	Sharp 6th	Sharp 7th	8th
1	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{15}{8}$	$\frac{16}{8}$ — $\frac{2}{1}$

In the second series, or flat key, thus:

K	2d	Flat 3d	4th	5th	Flat 6th	Flat 7th	8th
1	$\frac{9}{8}$	$\frac{6}{5}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{8}{5}$	$\frac{19}{9}$	$\frac{2}{1}$

Hence we can demonstrate (what before was taken for granted) the places of the greater and lesser tones, and semitone.

Now, the relative proportion or difference is found by division of the two next proportions in the natural order as above.

The places of the greater and lesser tones and semitones in the sharp key.

1) $\frac{9}{8}$ ($\frac{9}{8}$ the greater tone, or 2d.

$\frac{9}{8}$) $\frac{5}{4}$ ($\frac{40}{36}$ in its lowest terms $\frac{10}{9}$ the lesser tone, or sharp 3d.

$\frac{5}{4}$) $\frac{4}{3}$ ($\frac{16}{15}$ the semitone, or 4th.

$\frac{4}{3}$) $\frac{3}{2}$ ($\frac{9}{8}$ the greater tone, or 5th.

$\frac{3}{2}$) $\frac{5}{3}$ ($\frac{10}{9}$ the lesser tone, or sharp 6th.

$\frac{5}{3}$) $\frac{15}{8}$ ($\frac{45}{40}$ or $\frac{9}{8}$ the greater tone, or sharp 7th.

$\frac{15}{8}$) $\frac{2}{1}$ ($\frac{16}{15}$ the semitone, or 8th.

The places of the greater and lesser tones and semitones in the flat key.

1) $\frac{9}{8}$ ($\frac{9}{8}$ the greater tone, or 2d.

$\frac{9}{8}$) $\frac{6}{5}$ ($\frac{48}{45}$ — $\frac{16}{15}$ the semitone, or flat 3d.

$\frac{6}{5}$) $\frac{4}{3}$ ($\frac{20}{18}$ — $\frac{10}{9}$ the lesser tone, or 4th.

$\frac{4}{3}$) $\frac{3}{2}$ ($\frac{9}{8}$ the greater tone, or 5th.

$\frac{3}{2}$) $\frac{8}{5}$ ($\frac{16}{25}$ the semitone, or flat 6th.

$\frac{8}{5}$) $\frac{16}{9}$ ($\frac{80}{72}$ — $\frac{10}{9}$ the lesser tone, or flat 7th.

$\frac{16}{9}$) $\frac{2}{1}$ ($\frac{18}{16}$ — $\frac{9}{8}$ the greater tone, or 8th.

The use of this theory is chiefly on account of ascertaining the places of the semitone; the difference of the major and minor tones, which is as $\frac{81}{80}$, having not been hitherto reduced to practice.

We shall therefore hereafter admit no other distinction than that of whole and half tones.

The intervals then contained in the octave, in both keys, excluding the first term, will be more easily described thus:

The —— 2d is one tone.
Flat 3d a tone and a half.
Sharp 3d two tones.
4th two tones and a half.
Sharp 4th three tones.
5th three tones and a half.
Flat 6th four tones.
Sharp 6th four tones and a half.
Flat 7th five tones.
Sharp 7th five tones and a half.
8th six tones.

Having found all the intervals, their order and proportions; it will be necessary to take in one view the semitones of the octave, marked by their different names and intervals. For every semitone hath two names in respect to the preceding and following note in the natural order. As in the following example. The knowledge of this is most necessary to learning the art of composition. N° 7.

The discords being, as hath been shewn, the lesser 2d, or semitone, and greater 2d, the sharp 4th or false 5th, the lesser and greater 7ths, it is to be understood, that not any two or three of these are to be sounded together, to frame the discord; as the members of any concord are, to make the harmony: but each discordant note hath its discordant and concordant notes proper to itself, which fill up the discord; and which are called the accompaniments.

The five discords, then, being distinct and unlike each other; the definition of discord must be this:

Discord consists in certain variable proportions of the distance of sounds, performed at the same instant of time, and disagreeable to the ear.

Chap. II. Of the SCALE of MUSICK.

Having found that the larger combinations of the 13 semitones in the octave constitute the concords and discords; for the better application of them to our purpose, we shall next consider them singly and distinctly.

Diapason — — —	Octave — 8th.
Semidiapason Defective 8th, or — — Sept. major	greater sharp 7th.
Sept. minor — — —	lesser flat 7th.
Hexachordon major — — —	greater sharp 6th.
Hexachordon minor — —	lesser flat 6th.
Diapente — — — —	— 5th.
Semidiapente, or — — — Trione	— sharp 4th, or false 5th.
Diatessaron — — — — —	— 4th,
Ditone — — — — —	greater, or sharp 3d.
Semiditone — — —	lesser, or flat 3d.
Tone — — — — —	greater — — 2d.
Semitone — — — — —	lesser — — 2d.
Unison — — — — —	one sound.

As they succeed each other in the natural order of both keys, as above demonstrated; this is called the scale of musick.

In this scale we shall likewise take a view of the concords of the same denomination, as they arise in succession from the same natural order of the simple tones, and also of the discords as oft as they occur.

There are two scales in use: the diatonic scale, and the chromatic.

In the diatonic scale, the notes arise by two tones, a semitone,

ſemitone, and one tone to the 5th; and thence by two tones and a ſemitone to the 8th. This is the order in a ſharp key: where note, that the ſemitones are in the 4th and 8th places. No. 8.

In a flat key, the notes aſcend according to the following example. N° 9.

One tone, a ſemitone, and two tones to the 5th; a ſemitone and two tones to the 8th.

In the next example, the ſame proportion of the flat third is illuſtrated by compariſon with the inſtance in the ſharp key, No. 10.

The number of the tones and ſemitones in both flat and ſharp key are equal. The difference ariſes from the places of the ſemitone; which, in the flat key, are the 3d and 6th. This is that eſſential difference of tune already mentioned, which creates ſuch variety in muſical ſtrains, as well as in the harmony. Theſe are ſome effects of the ſemitone; others we ſhall ſee in its proper place.

The Chromatic Scale.

The chromatic riſes by a tone and 5 ſemitones to the 5th, and thence by 5 ſemitones more to the 8th. Thus No. 11.

The chromatic ſcale, which is no other than the natural ſemitones in their order, except the firſt tone, is only uſed when mixed with the diatonic. That is to ſay, when a ſemitone, not belonging to the harmony of the key, is introduced in the middle of a tune. And this may be done by the note aſcending by a ſemitone, or deſcending: in either of which caſes, the key is changed in that part of the ſtrain. This is the cauſe of great variety in the air; as well as it new-modulates the harmony. This is another effect of the ſemitone, on which turns ſo much variety and elegance. It muſt be executed by the compoſer with all the addreſs and art imaginable. For this we muſt refer to the ſecond part or practice; where will be given the rules for the mixture of the chromatic. Pieces of muſick where it is frequently uſed, are now commonly called chromatic muſick.

The diatonic ſcale being that which we are chiefly concerned to underſtand, as well as the firſt in order, and before any uſe of the chromatic can take place; we ſhall proceed to view it in another light, whereby we ſhall diſcover ſuch properties of it as will be uſeful to the compoſer. Sharp key. No. 12.

From the key the thirds aſcend, as in the above example, by one ſharp 3d, two flat 3ds, two ſharp 3ds, a flat 3d, and laſtly another flat 3d on the 2d to the key.

All the 4ths being perfect, are like; except that one which falls on the ſharp 7th; this is called a ſharp 4th, or falſe 5th. No. 13.

All the 5ths are perfect, and therefore like; except that formed by the ſharp 7th and 4th, which likewiſe is a flat 5th or ſharp 4th. No. 14.

The 6ths ſtand thus: two ſharp 6ths, one flat 6th; two ſharp 6ths, two flat 6ths. No. 15.

There are but two greater 7ths which are the ſharp 3d and ſharp 7th to the key: they ſtand under the two ſemitones.

All the 8ths are perfect and alike.

From theſe theorems, and axioms, the 2d and 4th, we deduce this practical corollary.

Cor. IV. The 3ds and 6ths are the intervals moſt frequently to be uſed in compoſition; the 8ths, 5ths, and 4ths moſt rarely.

The 4th being an improper concord, and the 7th a diſcord; we cannot aſcertain their uſe till we come to the demonſtration of the harmony and accompaniments of the diſcords in the 2d part.

On this 4th corollary is grounded the reaſon of forbidding two 8ths and two 5ths in conſecution, either in compoſition, or performing thorough baſs.

Next follow examples of the ſame in a flat key., No. 16, 17, 18, 19.

There are but two ſharp 7ths which are the 2d and 5th to the key. They ſtand under the ſemitones.

All the octaves are perfect and alike.

It is evident to ſight, that the intervals in the flat and ſharp key do not in the leaſt vary; except in the order they ſucceed each other, beginning from the key. And it is equally evident, that this variation is owing to the different places of the ſemitone.

This demonſtrates what has been ſaid in page 319. col. 1. concerning the ſemitone; and illuſtrates what is aſſerted in the 4th axiom, that variety, amidſt uniformity, muſt be the great object attended to in muſick, ſince that uniformity and variety both ſubſiſt in the very principles.

Let it be obſerved, that this uniformity is preſerved by bringing in the flat 6th and flat 7th to the key. And this muſt of neceſſity be ſo, ſince they are the places of the ſemitone and leſſer tone in the natural flat key wherein the example is ſet, according to the demonſtration of the ſame.

For, by corollary 1. nothing can be admitted in compoſition which doth not immediately depend on the 2d axiom, and which cannot be demonſtrated from it; namely, that the proportions of ſounds, and their relations, muſt be deduced from the natural order of the notes. This is the true reaſon for introducing the flat 6th and flat 7th in every flat key.

The harmonic proportions and diſcords having been demonſtrated from the diviſion of a line in arithmetical progreſſion; we ſhall, in the next place, try what are the effects of a muſical ſtring divided in geometrical proportion. No. 20.

Let A B, a muſical ſtring, be divided equally in C; C B, the half next the bridge, will ſound an octave to the whole or open ſtring, as we have ſhewn in the harmonic proportions.

Again, let C B be equally divided in D; D B will ſound the octave to C B, or double octave to the open ſtring, A B.

And thus, by an equal diviſion of a ſtring between either the nut and bridge, or ſtop and bridge; the half next the bridge will give the octave above continually.

But the ſame proportion is not preſerved in the equal diviſion between the nut and ſtop, or between any two ſtops. For the length of the octave to the open ſtring, which is between the nut and ſtop, being equally divided; the half next the nut gives the ſound of the 4th to the open ſtring; and the half next the ſtop, or bridge, ſounds

founds the 5th, which two are the constituent intervals of the octave.

And the fame divifion of the founds is conftantly preferved, if the length of an octave be equally divided between any two ftops.

Again, the length of a 5th between two ftops, or nut and ftop, equally divided; the half next the bridge gives the greater 3d, the other half the leffer 3d.

And again, the length of the greater 3d, thus divided, gives the greater and leffer tone. And the greater tone's length, equally divided, gives the greater and leffer femitone. And the length of the greater femitone, equally divided, gives the founds in proportion as 5 and 4. The greater interval being next the bridge, and fo continually.

Hence the neceffity of the greater and leffer tones and femitones in mufic is evident; and the truth confirmed, which is afferted in the 2d corollary.

Now, in the diatonic fcale, wherefoever the femitones lie, that is, whether the air be in a flat or fharp key, the graver part of the tone will be the leffer femitone, and the acuter the great femitone; and in the chromatic, which afcends by femitones, the greater and leffer femitones will, for the fame reafon, fucceed each other alternately. Wherefore, if any feries of chromatic notes be removed a femitone higher or lower; it muft happen, that the leffer femitone will fucceed into the place of the greater, and the greater into the place of the leffer. Hence diffonances will happen in the diatonic fcale, as being compofed of the fame materials with the chromatic, if the key be injudicioufly changed by tranfpofition. For, as the diffonance will be evident, if the tranfpofition be by one femitone; fo the difproportion will ftill appear, if the removal be by any odd number of femitones within the compafs of the 4th.

As the proportions of the concords have been demonftrated from the divifion of a line; fo are they likewife to be found in the geometrical proportions of folid bodies, and therefore may be illuftrated by the fame.

We fhall begin with the proportion of the 8th.

The proportion of the 8th being the compound proportions of the 5th and 4th, is, by corollary of the 34th propofition of Archimedes, as the whole fuperficies of a right cylinder defcribed about a fphere, to the whole fuperficies of an equilateral cylinder infcribed as 2 to 1. For, the circumfcribed is to the fpheric fuperficies as 12 is to 8 (by 32 of this,) but the fpheric is to the infcribed as 8 is to 6 by this prefent propofition: therefore the circumfcribed is to the infcribed as 12 is to 6, or 2 to 1.

In harmonic terms thus expreffed: the 5th is to a given note or key as 12 is to 8; but the proportion of the 4th is as 8 to 6. Therefore, the proportion of the 8th is $\frac{12}{8}$ $\frac{8}{6}$ as 2 to 1.

Again, the proportion of the 5th, and the next harmonical proportion arifing out of the 5th, is beautifully illuftrated in the admirable proportion of the fphere, right cylinder, and equilateral cone circumfcribed about each other. The laft proportion being invented by Andrew Facquet; and that of the two firft by Archimedes, as demonftrated in his 45th propofition in Tacquet's Euclid.

We cannot forbear tranfcribing at length this wonderful propofition, and demonftration of the fame; for that on this proportion is erected the whole fuperftructure of harmonic chords.

ARCHIMEDES's PROPOSITION 45.

THEOREM. An equilateral cone circumfcribed about a fphere, and a right cylinder in like manner circumfcribed about the fame fphere, and the fame fphere itfelf continue the fame proportion, to wit, the fefquialteral, as well in refpect of the folidity, as of the whole fuperficies. For, by 32d of this book, the right cylinder ( ) encompaffing the fphere, is to the fphere, as well in refpect of folidity, as of the whole fuperficies, as 3 is to 2, or as 6 to 4. But by the foregoing, the equilateral cone circumfcribed about the fphere, is to the fphere, in both the faid refpects, as 9 to 4. Therefore, the fame cone is to the cylinder, both in refpect of folidity and furface, as 9 is to 6 Wherefore, thefe three bodies, a cone, cylinder, and fphere, are, betwixt themfelves, as the numbers 9, 6 and 4, and confequently continue the fefquialteral proportion, Q, E, D.

In harmonic terms expreffed thus: the 5th is to the key as 3 is to 2, or as 6 to 4: but the 9th is to the key, (that is, the 5th to the 5th) as 9 is to 4; (for the 2d and its 8th $\frac{9}{8}$ $\frac{2}{1}$ — $\frac{9}{4}$:) therefore, the fame 9th is to the 5th as 9 is to 6. Wherefore thefe three tones, the 9th, the 5th, and the key, are, betwixt themfelves, as the numbers 9, 6, and 4; and confequently continue the fefquialteral proportion, Q, E, D.

Therefore, the proportions of the key, the 5th and its 5th, being the fame fefquialteral proportion continued, are the fame proportions as that of the equilateral cone, right cylinder and fphere; the two firft defcribed about the fphere, Q. E, D.

On the proportion of thefe three is erected every other proportion of harmony; which we fhall purfue one ftep further, forafmuch as thefe truths will be moft manifeft and eftablifhed in the practice when we fhall have delivered the rules of harmony.

The 5th divided arithmetically, or equally, gives, as hath been fhewn, the greater 3d or next perfect concord: the fefquialteral proportion to which gives the greater 7th; for $\frac{5}{4}$ $\frac{3}{2}$ gives $\frac{15}{8}$ the greater 7th, as demonftrated above.

Hence, from the fefquialteral proportion thrice repeated, namely, to the key, its 5th and 3d, we are furnifhed with the perfect harmony, or concords of the key and 5th; to which every harmonic proportion, where ever found, is analogous; that is, partaking of the nature, proportion, and relation of the key and its 5th. It is worth remarking in this place, that the members of thefe chords arife out of the proportions, as above demonftrated, by turns. The key being firft fupplied with one proportion; and then in its turn the 5th with the fame. Wherefore, the mixture of the harmony of the key and 5th is fcarcely feparable: A truth which will abundantly difcover itfelf in the practice, both in the rules of harmony, and in every other part of compofition. On this is founded the following axiom.

AXIOM.

AXIOM VI. These 5 tones therefore, namely, the key, the 3d, 5th, sharp 7th and 9th, are the foundation of the whole superstructure of musick.

We shall conclude this theory with the harmonical division of a line.

To divide a Line harmonically. No. 21.

A right line, A D is said to be divided harmonically, if, being cut into three parts, A B, B C, C D, the case be so, that, as the whole A D (or Z) is to either extreme *a* or *c* :: so shall the other extreme be to the indeterminate part *m*; that is,

$$\left.\begin{array}{l} Z : a :: c : m \\ Z : c :: a : m \end{array}\right\} \text{ Wherefore } Z\, m = a\, c.$$

And, to divide any given right line thus harmonically, as suppose A D: From either end of it draw a right line, as DG; make an angle with it, and of any length; connect the end of this line with the other end A, by drawing A G; and then taking any point, as B, at pleasure, in the given line, there draw E F parallel to D G, and in it take B E equal to B F; then draw E G, and that shall find the point C required: and then calling, as above, the whole line Z, A B = *a*, B C = *m*, and D C = *c*, I say $Z : a :: c : m$.

For the triangles A D G, A B F, and B E C, are all similar: and consequently A D : A B :: D G : : B F :: or as D G: to B F = B E. But as D G : B E : C D : B C; (by working about the equal angles D and E, B C) wherefore, by equality, A D : A B :: C D : C B that is, $Z : a :: c : m$. Q. E. D.

And from hence it is plain, that the ratio of the whole line A D, to the segment A B, may be taken at pleasure; but that the intermediate part B C must be less than either A B or C D.

PART II. THE PRACTICE OF MUSICK.

THE practice of musick is founded on the principles delivered in the theory. Its several parts are, composition, figuring the bass, melody, transposition, and singing by note.

Of these we shall treat separately in the above order.

Composition is the setting together two or more notes in harmony, to be sounded at the same time.

When in the succession of concords, in the parts, the notes of each part are of the same length, or time of sounding, the composition is called counterpoint.

When the succession of concords is by notes of different lengths in the several parts, it is called plain descant.

The mixture of discord and concord, by notes of the same or different lengths or time in the parts, is called figurate descant. Of these in their order: and first of counterpoint.

In order to attain more easily the art of composition, it is necessary to premise a few things concerning other affections of sounds; as the time or lengths of sounding the notes; the time of musick, or movement of the air; and the different cliffs wherein the parts of musick are usually written.

The following account of the proportions of the lengths of notes, the time and cliffs, being well understood by every one acquainted ever so little with musick, might well have been omitted in an essay of this kind; (where, instead of using repetitions, it is hoped we have offered to the public something new; at least in the manner of demonstrating the rules of composition, both in discord and harmony;) but that we would leave nothing in our power untold, which may contribute to form a compleat musician.

The longest note, now generally in use in instrumental musick, is called a semibreve. Its time is as long as you can distinctly count for.

Out of the division and subdivision of the semibreve are formed the lengths of all other notes; according to the following proportions No 22.

A semibreve, whose time is as one, two, three, four, is as long

as 2 Minums,
4 Crotchets
8 Quavers,
16 Semiquavers.
32 Demisemiquavers.

A dot after any note, signifies the time of such note must be lengthened to one-half of the plain note. No. 23.

The proportions are thus;

A dotted semibreve is equal to 3 minums.
A dotted minum to 3 crotchets.
A dotted crotchet to 3 quavers.
And so of the rest.

Thus we are furnished with notes according to the odd and even numbers. And this naturally divides the time of any song or music into odd and even time.

COMMON TIME.

When the air moves according to the even numbers; and every bar is measured by beating the time into two equal and even parts, the musick is composed in common time: known by one of the following marks prefixed to the tune; as the letter C, having 4 crotchets in a bar; or $\frac{2}{4}$, denoting two crotchets in a bar.

TRIPLE TIME.

But when the musick moves according to the odd numbers, and every bar is measured by beating the time into two unequal parts, as two and one, the song is composed in triple time; which is known by one of these signs prefixed to the tune.

3, or $\frac{3}{2}$, for 3 minums in a bar.
$\frac{3}{4}$ 3 Crotchets in a bar.
$\frac{3}{8}$ 3 Quavers in a bar.
$\frac{9}{4}$ 9 Crotchets in a bar.
$\frac{9}{8}$ 9 Quavers in a bar.

The uppermost number being the numerator of a vulgar fraction; and the lower, or denominator, the aliquot part of the semibreve.

There is also another proportion of the length of notes in use. And this is, when three quavers are, by diminution

nution of their lengths, contracted into the time of 2 quavers, or one crotchet, conſtantly noted by the figure (3) over them.

And laſtly, the moſt common movement of jiggs, which is by ſix or twelve quavers in a bar, have their baſs, for the ſmoothneſs of the movement, often written in plain crotchets; 2 in a bar for the treble $\frac{6}{8}$; and four, marked thus C, for the treble $\frac{12}{8}$. It is plain, therefore, that all tunes in theſe movements truly belong to common time, ſince every bar is meaſured by the beating, or dividing it into even parts, as expreſſed in the baſs.

A pauſe or reſt in muſick, is a ceſſation of the ſound, in one or more of the parts; or of all the parts together. Nothing hath a finer effect in muſick than a pauſe of all the parts judiciouſly made; or of one, or more of the parts, for the ſake of imitation. The reſts therefore are written down in the place of notes, and each note hath its own reſt, which is of the ſame length with the note whoſe name it bears. Thus,

A ſemibreve reſt is as long as a ſemibreve.

A minum reſt as long as a minum.

And ſo of the reſt.

The next thing to be conſidered is the cliff in which any part of the muſick is ſaid to be written; according as the cliff is prefixed to each ſtave of the writing.

The uſe of the cliff is to aſcertain the names of the notes; and to denominate that part of the muſick to which it is prefixed.

There are three cliffs, to anſwer and diſtinguiſh the three parts in muſick: The baſs, or F cliff; the tenor, or C cliff; and the treble, or G cliff. No. 24.

The baſs is ſo called, from its being the loweſt part, or that wherein are ſet the graver tones.

The tenor, or middle part, hath its name from holding the baſs and upper parts together. This will be clearly underſtood, when we ſhall have learned to compoſe in four parts.

The uppermoſt part is called the counter-tenor in vocal muſick; and, in inſtrumental, the firſt treble.

The baſs and treble cliffs are now conſtantly written in the ſame places as in the examples. The tenor cliff is often removed, according to the fancy of the compoſer or writer of muſick; to anſwer the convenience of the notes ſtanding, as much as may be, within the compaſs of the five lines, or ſtave. Which convenience is the reaſon for the invention of the diverſity of cliffs, as well as the uſes already named. For it is eaſy to apprehend, that the natural tones, and their proportions, are invariably the ſame, whether expreſſed by the voice, or an inſtrument, however they may be diſtinguiſhed by artificial ſigns. Obſerve, that the cliffs, according to their names, riſe above each other by the interval of a 5th: thus the tenor is equally diſtant from each other part. For C is a 5th to F, as it is alſo a 5th below G.

Chap. I. Of COMPOSITION in COUNTERPOINT.

Composition in counterpoint is when, in the ſucceſſion of concords in the parts, the notes of each part are of the ſame length, or time of ſounding.

According to the 2d axiom, we ſhall begin with the harmony of the key note; and proceed to demonſtrate the harmony of the remaining notes of the octave in their natural order.

Demonſtration of the harmony of the key.

The harmony of the key is the concord of itſelf.

The harmony of the key muſt be perfect harmony. Now, the notes concording in perfect harmony, are, by corollary 3d, the 3d, 5th, and 8th: But theſe, with the key, are the concord of itſelf: Therefore, the harmony of the key is the concord of itſelf.

This demonſtration is grounded on this evident truth; namely, that any other concord would, by the term, or name of it, in effect change the key; whereby the unity of the tune would be deſtroyed, and by this contradiction the author's meaning rendered unintelligible. The neceſſity of perfect harmony in the key being evident, no other ſort of demonſtration is required, nor indeed can be admitted.

Prob. Let it be required to ſet a baſs to the notes of an octave aſcending in G ſharp. No 25.

Any one of the three notes in the baſs is concording, by corollary 3; but the 8th is preferable when it is the firſt or laſt note of the tune; for thus it beſt aſcertains the key. The preference of either of the other two depends on the following rules.

Firſt, The 5th cannot take place when the concord immediately preceding ſhall happen to be a 5th, the forbidding the conſecution of 5ths being aſſerted in corollary the 4th.

Again, the movement of the baſs ought generally to be by deſcending a 5th, or riſing a 4th, 6th, or 8th, or any other great interval; thereby meeting the treble, and effecting variety and contrary motion of the parts; the eſtabliſhed rules of harmony by the 4th axiom.

Laſtly, The air of the baſs muſt be conſulted; and, if poſſible, an imitation of ſome foregoing paſſage in the upper part.

The application of theſe rules will decide which of the two or three notes is preferable in this or any other concord.

Demonſtration of the harmony of the 2d.

The harmony of the 2d is the concord of the 5th.

The harmony of the key having been ſhewn, we muſt conſider it as an immoveable point, in relation to which we are to order the reſt of our computations, conſiſtent with the eſtabliſhed principle of uniformity.

The 2d to the key immediately deſcending into the key, will have, for its next concording note, the greater 7th; which at the ſame time aſcends by a ſemitone into the key; to which 7th the 2d is a 3d.

For, by axiom 2, the combination of ſounds are deduced from the natural order of notes aſcending and deſcending. But the 2d and 7th can admit no other concordant note but the 5th to the key. For the 3d is diſcord with the 2d; and the 4th, 6th, and 8th diſcord with the ſharp 7th.

Now, the 2d, 7th, and 5th are the concord of the 5th; therefore, the harmony of the 2d is the concord of the 5th. No. 26.

The

The 5th muſt always be taken at the cloſe; or when the treble is deſcending into the key; for then the baſs will fall a 5th into the key; which movement is called the great cadence. Otherwiſe the 7th or 5th may be taken indiſcriminately; yet, under the reſtriction of the rules, (p. 326. col. 2.) for ſetting the harmony of the key.

Demonſtration of the harmony of the 3d.

The harmony of the 3d is the concord of the key.

From the demonſtration of the harmony of the key, the key will have its 3d; and, by inverting, the 3d will have the key. Now, the key and its 3d will admit no other concordant note but its 5th: For the 2d is diſcord to both, the 4th is diſcord to the 3d, and the 7th diſcord to the key; but the key, its 3d and 5th, are the concord of the key. Therefore, the harmony of the 3d is the concord of the key.

The 6th indeed, which is a 4th to the 3d, which is an improper concord, will, with the key, form the concord of the 6th; but the demonſtration of the concord of the 6th in a ſharp key, depending on another priuciple, as will be ſhewn in its place, can, for the ſame reaſon, bear no relation to the harmony of the 3d, which is a member of the key: No. 27.

The two notes in the baſs may be taken indiſcriminately; yet complying with the rules, (p. 326. col. 2.) But, if the 3d in the treble be prepared to deſcend into the key, by its paſſage into the 2d, then the 5th is more eligible; which falling an 8th for the next note, thence deſcends by a 5th into the key. This is the moſt ſtriking movement of the baſs; and, at the ſame time, the moſt common, at a final cloſe in either flat or ſharp key.

Demonſtration of the harmony of the 4th.

The harmony of the 4th is the concord of itſelf.

In a ſharp key, the places of the two greater 7ths are the ſharp 3d and ſharp 7th to the key: and, of the ſemitones, the 4th and 8th, or key; Therefore, the 3d is to the 4th as the ſharp 7th to the key. Now, ſince by axiom 2d, the combinations are deduced from the natural order of the notes aſcending and deſcending; the harmony of the 4th will be as the harmony of the key: But the harmony of the key is (by demonſtration 1.) the concord of itſelf: therefore, the harmony of the 4th is the concord of itſelf. No. 28.

The notes in the baſs may be taken indiſcriminately: only obſerving the foregoing rules. If a cloſe on the 4th be prepared from the 4th itſelf, either note will do: yet the key is preferable, in order to prepare for the great cadence.

Demonſtration of the harmony of the 5th.

The harmony of the 5th is the concord of the key.

From the demonſtration of the harmony of the key, the key will have its 5th; and, by inverting, the 5th will have the key. Now, the key and its 5th will admit no other concordant note than the 3d. For, the 2d and 4th are diſcord with the key and 5th; the 6th diſcord with the 5th; and the 7th diſcord with the key. But the key, its 5th and 3d, are the concord of the key: therefore, the harmony of the 5th is the concord of the key. No. 29.

There is no exception in the choice of the baſs notes; but the diſallowance of the conſecution of 5ths. But if there be a preparation for a cloſe on the key, and the 5th ſtand in the baſs; in order to make the great cadence, the 5th will have its own concord. This depends on the demonſtration of the 2d.

Demonſtration of the harmony of the 6th.

The harmony of the 6th is the concord of the 4th.

From the demonſtration of the 4th, its harmony is its own concord. The 4th, then, will have its 3d; and, by inverting its 3d (that is, the 6th) will have the 4th. Now, the 4th and 6th will admit no other concordant notet han the 8th: For the 2d is, (with the 4th and 6th,) a diſcord, as will be ſhewn in the demonſtration of the diſcords. The 3d and 5th are diſcord to the 4th, and the 7th to the 6th. But the 4th, 6th, and 8th, are the concord of the 4th: therefore, the harmony of the 6th is the concord of the 4th. No. 30.

Either note in the baſs may be taken at will. But if there be a preparation for a cloſe on the 4th, the ſecond note, or key, is preferable, for the reaſons aſſigned in the demonſtrarion of the 4th, which is, to make the great cadence, prepared by the baſs, firſt deſcending an 8th, and thence a 5th, into the 4th, or cloſe.

Demonſtration of the harmony of the 7th.

The harmony of the 7th is the concord of the 5th.

The harmony of the 7th is part of the harmony of the 2d, (by demonſtration 2.) but the harmony of the 2d is the concord of the 5th: therefore the harmony of the 7th is the concord of the 5th. No 31.

If the 7th, or treble note, precede a cloſe on the key, the firſt note in the example muſt be the baſs note, in order to make the great cadence.

The 8th being the key, hath for harmony its own concord; as by demonſtration 1.

From the foregoing demonſtrations, the baſs notes, ſet to the 8 aſcending notes in the treble, will ſtand thus.

General Rule. The conſecution of 8ths, 5ths, and 4ths, is not allowed, (as by corollary 4.) except by contrary motion of the parts, or in the paſſage of very quick notes in compoſition of many parts. No 32.

From taking in one view the harmony of the ſeven notes, we ſhall deduce ſome uſeful corollaries. No. 33.

Key	2d,	3d,	4th,	5th,	6th,	7th,
hath the harmony of the						
Key	5th,	Key	4th,	Key and	5th,	4th, 5th,
Semitone.			Semitone.			

Cor. I. Every note in the octave (except the 2d to the key) admits in its harmony a 3d.

Cor. II. The key, the 2d and 5th, admit in their harmony a 4th.

Scholia.

When the key admits a 4th, the concord is of the 4th.

When the 2d admits a 4th, the concord is of the 5th.

When the 5th admits a 4th, the concord is of the key.

Hence the interval of that note which admits a 4th, is in fact a 5th: therefore two 4ths are no more allowed in

in consecution than two 5ths. And hence likewise the interval of the 4th, which we have called an improper concord, appears to be of a middle nature between concord and discord; being a fourth in name and appearance in the natural order of sounds; yet a 5th in name and effect in composition, as member of that chord wherein it makes a part of harmony.

Cor. III. The key, the 4th and 5th, admit in their harmony a 5th.

SCHOLIA.

When the key admits a 5th, the concord is that of the key.

When the 4th admits a 5th, the chord is of the 4th.

When the 5th admits a 5th, the concord is of the 5th.

Hence, when a note admits a 5th, the harmony is the concord of the same note.

Cor. IV. Every note but the 4th admits a 6th; for, the 4th having its concord for harmony, will have only its 5th.

Every note admits its 8th; for any note may be substituted for its octave. But 8ths are (by corollary 4. of the theory) to be the most sparingly used, as not producing that variety or mixture of sounds requisite to bind the harmony, especially, where it can be best avoided, in the composition of two parts.

From the foregoing demonstrations and corollaries, arise the following observations.

The 3ds and 6ths most frequently occur in composition. This then demonstrates what was asserted, by way of precept, in the 4th corollary of the theory as well as part of the 4th axiom; namely, that the proportions of musical sounds, and the variety emerging from them, point out to us this variety, and will not suffer us to depart from the established precept.

It will be necessary to see the same truths comfirmed in the descending notes. We shall therefore set down instances of composition in the descending notes of the octave upon the same principles, and wherein the same demonstrations and corollaries do take place.

Example of composition in the descending notes of the octave. No. 34.

In the ascending notes, when the upper part rises by a semitone, the bass generally falls a 5th; when the upper part falls by a whole tone to a close, the bass also falls a 5th. This fall of the bass, or great cadence, must be effected when chromatic notes are introduced ascending; it being the property of the new semitone, thus formed by the note rising a half tone, to imitate the key or close. By axiom 2. the proportions of sounds, and properties of the same, are deduced from the natural order of the notes. Now, by the new semitone introduced, the note below imitates the greater 7th to the key: therefore, in this case, as in a close on the key, the bass must fall a 5th.

Notwithstanding, this must be understoood not of the passage of quick notes; and chiefly at a close.

Sect. 2. *Of Composition in a* FLAT KEY.

FROM the difference between the flat and the sharp key which lies in the different places of the semitone, there will arise a variety in the composition in a flat key, yet resting on the principles and demonstrations delivered in the last section.

The places of the semitone in the sharp key are the 4th and 8th. In a flat key, the semitone stands in the 3d and 6th places. The variety in the composition will happen where the semitones are concerned. For, as the middle close is made in the sharp key on the 4th, which is the semitone; or, as the 4th in the sharp key hath (by demonstration of the harmony of the 4th) its own concord for harmony: so the middle close in the flat key is made on the 3d, which is the semitone; or the flat 3d will have for harmony its own concord. Now, as the 4th hath its 3d and 5th for harmony, (which are the 6th and 8th of the key;) so the flat 3d will have its 3d and 5th, which are the 5th and 7th of the key.

Again, the flat 7th of the key being the 5th to the 3d, will, like the 5th of the sharp key, have for harmony its own concord. This will cause the 2d of the key to appear as the sharp 7th to the 3d, and the 4th of the key as a 2d (which it really is) to the 3d. Thus the whole harmony will be new modulated by the power of the semitone. Again, the flat 6th being the semitone, a middle close may be made on that note; and then the same proportional variety succeeds, and new harmony, as in the former case.

Lastly, at the end of the musick, where there must of necessity be a close, the flat key will have the greater 7th, like the sharp one. Of so great consequence is the semitone. Nor indeed can a close be made at all, without the passage of a semitone in one or other of the parts. No. 35.

Differences in the flat key noted.

In the first example the harmony of the 2d is the concord of the flat 7th, as being 5th to the third.

The close is made on the 3d, the bass falling a 5th.

The 4th hath its own concord, as in the sharp key.

The 5th standing in an octave, may be understood as part of the harmony of the 3d, as the 3d to the key, in a sharp key.

The 6th is part of the 4th's concord, as in the sharp key; as above in the remark on the 4th.

At the close, there is the sharp 7th, from which the bass makes the great cadence.

In this example there happen four 8ths: the first and last are absolutely necessary to ascertain the key; by the second there is a close made on the 3d; and that on the 5th, is for the sake of the air in the bass.

In the second example, the harmony of the 4th is the concord of the flat 7th, as 5th to the 3d.

The harmony of the flat 6th is it own concord, being the place of the semitone; where the bass rises a 4th (the same as falling a 5th) as on a close in the treble ascending by the semitone.

In the 3d example, these differences of the flat key are left out; and the notes set as if they were part of a sharp key: that is to say, there is no close made on the 3d; the 4th hath its chord for harmony; and the 6th is likewise part of the harmony of the 4th.

For, notwithstanding the propriety of making a close on the 3d and 6th, which are semitones; yet the composer is

is not under the neceſſity of making a cloſe in theſe places in every paſſage; and then he is at liberty of ſetting the notes as in the example. This obſervation clearly points out the difference of compoſition in a flat key, and where it is to be practiſed.

And indeed an author, whoſe ſole end is to pleaſe the ear, will deſignedly introduce a cloſe on the flat 3d, and in as many other paſſages as he can, to create the variety ſo much deſired. In theſe caſes, the rules delivered for compoſition in the flat key muſt undoubtedly take place.

The fourth example is ſet to ſhew the movement of the baſs to the deſcending notes. The compoſition is the ſame as in the other examples.

Let us now take, in one view, the full harmony of every note in the flat key, and where the difference between it and the ſharp key lies: from which we may derive ſome uſeful corollaries. No. 36.

The harmony of the
2d, 3d, 3d, 4th,
is the concord of the
Flat 7th, 3d, Flat 6th, Flat 7th.

Cor. I. The 2d admits a 3d; then the concord is of the flat 7th.

Cor. II. The 3d admits a 5th; the concord is of the 3d.

Cor. III. Again, the 3d admits a 4th; then the concord is of the flat 6th.

Cor. IV. The 4th admits a 4th and 6th; the concord is the flat 7th.

By comparing theſe with the corollaries on the ſharp key, it will be evident, that each note in the flat key admits for its harmony that note which was excluded in the ſharp key. And therefore, that all harmony is divided between the flat and ſharp keys; and wonderfully diverſified by changing the places of the ſemitone.

From the demonſtration of the harmony of the 5th, with corollary 3. on the ſharp key, and the ſcholium 3. on the ſame, we gather how great a ſhare of the harmony belongs to the 5th. For it is part of the harmony of the key, and of the 2d (which chord is its own, or that of the 5th) in both flat and ſharp key: and, in the flat key, it is likewiſe in the harmony of the 3d.

The nature and properties of the ſemitone being the ſame in both keys, we can now more clearly demonſtrate the harmony of it in the following manner.

The harmony of every ſemitone is the concord of the ſame.

The key always ſtands between the greater 7th below, and the whole tone, or 2d, above. Now, by axiom 2. of the theory, the proportions, properties and relations of ſounds are deduced from the natural order of the notes aſcending and deſcending: The 4th (in a ſharp key,) the flat 3d, and flat 6th, being ſemitones, are diſtant by a half tone below, and a whole tone above, as is the key; therefore they have the ſame properties with the key. But the harmony of the key is the chord of the ſame: therefore the harmony of the ſemitone, or 4th, flat 3d, and flat 6th, is the chord of the ſame. Hence we raiſe the following axiom.

Axiom I. The harmony of every member of the concord of the key, is the concord of the key. And the harmony of every note in the compaſs of muſick, proved by the rules of harmony, is part either of the concord of the key, or of its 5th, or of a ſemitone. Hence variety in muſick is introduced by the contrary motion of the parts, and by changing the key, by bringing in new ſemitones. The better to illuſtrate this axiom, we ſhall hereafter in the examples ſet harmonical figures over every note, expreſſive of the chord.

First Example.

Let it be required to ſet a baſs to this treble in G ſharp. No. 37.

Harmony of the
Second Example. No. 38.

Harmony of the
Third Example.
In A flat, No. 39.

Fourth Example.
In G flat, No. 40.

Fifth Example.
In A flat, No. 41.

Sixth Example.
In D ſharp, No. 42.

In theſe examples every paſſage occurs which hath been delivered in the precepts of compoſition.

Take notice, that in the laſt example, the four paſſages, where the harmonic figures are not ſet over the notes, are part of a diſcord; which would take place, if the compoſition were in three parts; and which we cannot explain till we come to figurate deſcant.

Sect. 3. *Of Compoſition in* Three Parts.

The harmony, or full concord, of every note being well underſtood, both by reading the foregoing examples, as well as making application of the rules of compoſition on which the examples are framed, by trial of ſetting baſſes to other airs; the next ſtep will be to proceed to compoſition of three parts.

This requireth no other precept than thoſe already delivered, touching the harmony of each note. For the third part conſiſts of the remainining notes of each concord which have not been made uſe of in the compoſition of two parts. Yet this caution muſt be uſed, that the two upper parts ſtand in the neareſt concord to each other: that is to ſay, in 3ds as much as may be, and is conſiſtent with variety and contrary motion of them. For hereby two points will be gained: firſt, it will bind the harmony; and ſecondly, the baſs, being more at liberty to riſe and fall by greater intervals, will meet the upper parts at every point, and produce variety by his contrary motion. The following examples are the ſame ſet in two parts above.

Prob. Let it be required to ſet a baſs and ſecond part to this treble. No. 43.

Prob. Let it be required to ſet the aſcending notes of the octave in three parts, in a flat key.
In G flat, No. 44.
In A flat, No. 45.
In G flat, No. 46.

The

The harmony of the ſeventh bar in the laſt example, is altered in the repetition; though the notes of the firſt treble be the ſame.

In the firſt inſtance, the concords are of the key and 5th. In the repetition, the concords are of the 3d and flat 7th.

In the firſt inſtance, the paſſage from the 5th into the key, (in the 8th bar,) being the great cadence, is juſt.

But if otherwiſe a cloſe had been made on the 3d, (in the 8th bar,) the harmony in the ſecond inſtance muſt, for the ſame reaſon, be preferred.

Hence it will be eaſy to decide in all flat keys, (to which only this caſe belongs) when the harmony of the 3d is to be part of the concord of the key, and that of the 2d the concord of the 5th ; or, when the harmony of the 3d is to be its own concord, and that of the 2d or 4th part of the concord of the flat 7th.

Hence, and from corollary 1. of the theory, and from the demonſtration of the harmony of the ſemitone, we deduce this general theorem.

The trueſt harmony is produced by the whole concords taken together falling in ſucceſſion, as frequent as is conſiſtent with the approved rules of harmony, by a 5th.

We ſhall put an end to compoſition in three parts, with the following example in a flat key, being one of theſe above in two parts. No. 47.

The uſe we ſhall make of this example is to remark, that although the baſs be altered from that which is ſet in the ſame example in two parts: yet the harmony is the ſame, as is evident from the harmonic figures ſet over each.

Secondly, The 4th having its own concord, paſſes into the key, or 3d, in the paſſage of quick notes, and where there is not a cloſe. But where, on the 6th bar, a cloſe is made on the 3d, the baſs making the great cadence, the 4th in the preceding bar is part of the concord of the flat 7th. And thus the whole harmony falls a 5th.

We have altered the baſs alſo to anſwer the purpoſe of the movement of the upper parts in the cloſeſt harmony. And likewiſe to prove, that compoſition of many parts differs from that of two only. A truth which every compoſer ſhould always have in view. For it will be found, upon trial, that, when the muſick is ſet in two parts, if it be required to add a third, it will not be in the power of the compoſer to give that third part an air. A matter which ought to be ſtudied by all means ; and which, t is evident from the example, can be executed, without injuring the harmony in the leaſt, by compoſing the three parts together.

We therefore recommend it to the practitioner to make himſelf perfect in the compoſition of two parts, before he engages in three ; as he will thereby not only ſooner become maſter of the harmony ; but alſo, by diſcovering more clearly the difference we are pointing out, will execute the compoſition of three parts with more eaſe and propriety.

Sect. 4. *Compoſition of* FOUR PARTS.

IN compoſition of 4 parts, every note in the concord is taken ; or to every note there is full harmony.

The fourth part, or tenor, now to be added, conſiſts of the remaining note of the concord, which was not uſed in compoſition of three. The octave therefore will take place in the concord of every note. The conſecution of which, as well as of 5ths and 4ths, is to be avoided between the ſame parts. The rules already delivered in the compoſition of three parts muſt be attended to in this.

Example of the aſcending notes of the octave in compoſition of 4 parts. No. 48.

SECOND EXAMPLE.

In the deſcending notes of the octave in compoſition of 4 parts. No. 49

THIRD EXAMPLE in 4 Parts.
In A flat, No. 50.

FOURTH EXAMPLE in 4 Parts.
In G flat, No. 51.

In compoſition of 4 parts, it was ſaid, that to every note there is full harmony. Notwithſtanding, in the firſt example, the ſixth notes of the firſt treble and tenor are in uniſon ; each being a 6th to the baſs ; ſo that the octave hath no part in that concord. This is done to avoid the conſecution of 8ths, by the ſucceeding note of the tenor, whoſe place muſt be, for the air's ſake, the 8th to the baſs, as well as to bind the harmony.

In the ſecond example, the ſeventh notes in the firſt and ſecond trebles are in uniſon ; both being a 5th to the baſs. Let not this be underſtood to be a conſecution of 5ths, as they are members of the ſame chord ; but is done for the ſake of the air of the ſecond treble. Let this remark ſerve for every like inſtance which may happen hereafter.

In the fifth bar of the third example, the ſecond note, the ſecond treble and tenor are in uniſon. This is done to avoid the conſecution of 4ths, which, had the tenor kept his place, would have happened from the foregoing note between the firſt treble and tenor.

In the ſame example, there is a conſecution of 5ths in the two next bars, by the tenor falling a 4th, and the baſs riſing a 5th. This ſeeming error is tolerated ſince it is effected by contrary motion of theſe parts. For as well as it is by the contrary motion of the parts, that the conſecution of perfect concords is avoided ; ſo for the ſame reaſon, the ſameneſs of the harmony diſappears, or eſcapes the ear ; eſpecially in compoſition of many parts.

By this reaſon, the conſecution of 4ths is prevented by the baſs riſing a 3d, according to the firſt obſervation on this example, at the 5th bar. For that would have happened by all the parts deſcending ; that is, not having contrary motion. The ſecond note then of the baſs in that bar is changed from that which is ſet in the ſame example in three parts.

A few general remarks occur in this place, from comparing the compoſition of four parts with that of three.

Firſt, Whereas the perfect concords have place in ſome part of the harmony of every note in muſick of 4 parts ; ſo the chances of the conſecution of 8ths and 5ths being more frequent, the more ſkill and attention will be required to avoid them.

Secondly,

Secondly, Compoſition of 4 parts differs in many particular paſſages from that of three, though the general precepts of harmony belong to both. For, by comparing the ſame example in both caſes, there will be ſeen a variation of ſome paſſages in the lower parts. The neceſſity of complying with the eſtabliſhed precept of variety, by preventing the ſucceſſion of perfect concords, hath cauſed this alteration. See the 5th bar of the example in A flat in the three different compoſitions.

Hence ariſes a new reaſon for ſaying the compoſition of many parts differs from that of few, or two only. Therefore, in whatever number of parts the muſick is to be compoſed, one deſign muſt be firſt laid down; and to adjuſt and perfect the harmony, and to create as much variety as poſſible, the whole work muſt be planned at once, and executed agreeable to that deſign.

Laſtly, Of the tenor in particular, we have this to remark, That, whereas in compoſition of three parts, there is often a liberty left of taking any one of the concordant notes to the baſs; in four parts, the fourth or tenor coming in leaves no room for that liberty; but obliges us to a certain diſpoſition of each member of the harmony, and by this means holds together the parts, the octave every where ſounding and binding the inner notes together.

This remark on the tenor is more particularly true at almoſt every cloſe, where the tenor note is the 8th to the baſs on the laſt note but one of the cloſe; and, by keeping its place, while the baſs making the great cadence falls a 5th, the ſame tenor note becomes its 5th. Thus the two concords are held together and entire by the tenor's not removing.

Sect. 5. Composition *of* Five Parts.

The four concordant notes anſwering exactly to four parts in compoſition; when a fifth part is to be added, it is evident one note of the harmony muſt be repeated in every concord. The fifth part therefore conſiſts of the notes which are by turns repeated in each of the former, in which the avoiding the conſecution of the perfect concords is to be obſerved as before; and the air of this part attended to as far as may be conſiſtent with the rules delivered.

Example of compoſition of 5 parts in the aſcending notes of the octave. N. 52.

Second Example in 5 parts. No. 53.

The two octaves between the tenor and baſs on the ſixth and ſeventh notes of this example, are allowed; as the parts do not move into other notes, or make a new concord.

Third Example in 5 parts. No. 54.

The conſecution of 5ths between the tenor and baſs is admitted, as they meet by contrary motion of the parts.

Fourth Example in 5 parts. No. 55.

It is obſervable from theſe examples, that the moſt difficult compoſition is that of 4 parts. The other 4 parts, conſiſting of a repetition of one or more of the concordant notes of the firſt four parts, are more eaſily contrived, nothing more being required than to avoid the conſecution of the perfect concords between any two parts.

Sect. 6. Composition *of* Six Parts.

In muſick of ſix parts there is a repetition of two concordant notes. The ſixth part therefore conſiſts of the notes which take place in each of the five former, by turns.

An example or two will ſufficiently illuſtrate this.

Example of compoſition of 6 parts. No. 56.

There is a conſecution of 8ths between the fourth line and baſs, on the 3d and 4th notes; but it being the effect of contrary motion is admitted.

Second Example in 6 parts. No 57.

The two 8ths between the tenor and baſs are allowed; for, as they do not move, they are in effect but one.

Third Example in 6 parts. No. 58.

The conſecution of 8ths is by repetition of the ſame note, and therefore reckoned as one.

Fourth Example in 6 parts. No. 59.

In the 8th bar there is a conſecution of 8ths between the third part and tenor effected by contrary motion of theſe parts.

Sect. 7. Composition *of* Seven Parts.

In compoſition of ſeven parts, three notes of the harmony are repeated in each concord. The ſeventh part therefore conſiſts of the notes which are taken by turns from each of the ſix former; or, which is the ſame thing, from the firſt four; under the reſtriction of the rules concerning the conſecution of 8ths, 5ths and 4ths between any two of the parts, unleſs produced by contrary motion of the ſame, or repetition of the notes, or in the octave, as ſaid above. The ſeventh part is written in the tenor cliff, and is a ſecond tenor to the firſt; ſo that, like the upper parts, it muſt ſtand in the neareſt concord to the firſt tenor, or next part.

Firſt example of compoſition of 7 parts. No. 60.

Notwithſtanding it hath been ſaid, that three notes of the harmony are repeated in each concord in ſeven parts; yet it doth not appear in every inſtance in the example. The reaſons are, that in every cloſe, whether middle or final, it is preferable that moſt of the parts ſhould end in the concord note of the cloſe, and eſpecially of the laſt cloſe, that the harmony of the key may make the deeper impreſſion on the ſenſe.

Secondly, The air of each part ſhould be conſulted: for this will not only juſtify, but demand the changing of one note of the harmony for another.

Again, as the parts next each other ſhould ſtand in the cloſeſt concord; ſo, in order to effect this ſometime by contrary motion, they will meet in uniſon; and therefore the repetition of the three notes will not take place in every chord.

Theſe rules will be ſufficient to anſwer any doubt, or determine any choice to be made of any note of the concord, as well as juſtify the meeting of the parts in uniſon, in muſic of any number of parts whatever.

Second example in 7 parts. No 61.

Third example in 7 parts. No. 62.

Sect. 8. Composition *of* Eight Parts.

The eighth and laſt part is the ſecond baſs; concerning

ing which the following rules and obſervations muſt be premiſed.

If the muſick be compoſed for voices and inſtruments in full choir, it will be elegant and proper that the ſecond baſs ſtand in the neareſt concord with the firſt, after the example of the trebles and tenors.

The reaſon is, that the two choirs ſinging either together, or in reſponſes, will thus exhibit greater variety.

After this manner we ſhall ſet the two following examples.

If the muſick be for inſtruments only, the difference of the baſſes conſiſts in two things: Firſt, The organ hath the figures of the thorough baſs written. Secondly, The baſs viol performs the ſolo parts, while the organ reſts. And in full concert the two baſſes move in uniſon. This is the manner in which the baſſes of inſtrumental muſick are ſet by the moſt approved maſters.

We ſhall in this place offer our opinion on the ſubject of two baſſes in inſtrumental muſick, relating to ſome alteration from the uſual method of practice deſcribed above; which, as being perhaps new, will be received according to the notice it deſerves.

We would have the part for the organ move in long notes, and by the leaſt intervals; the figures filling up the harmony and diſcord; while the part for the violoncello moving in quicker notes, and greater intervals, becomes deſcant to the other baſs. Of this an example ſhall be given when we come, in the next place, to treat of plain deſcant.

To return: In muſick of 8 parts, the four notes of every chord are repeated, (allowing the exceptions remarked above.) Therefore, the full harmony of every note is double. The due mixture of which, according to the rules delivered, and the contrary motion of the parts, produce all the variety which harmony without diſcord is capable of affording.

First example of compoſition of 8 parts. No. 63.

Second example in 8 parts. No. 64.

Having given examples ſufficient for inſtruction in compoſition of harmony in the ſeveral parts of muſick, and having illuſtrated in the ſame examples what hath been ſaid concerning the harmony proper both to flat and ſharp keys; we ſhall proceed to make ſuch obſervations on compoſition in general, as may aſſiſt the practitioner in the application of the rules at the beginning, or firſt attempts.

And firſt, concerning the conſecution of perfects; which muſt be avoided, except in contrary motion of the parts, or repetition of the concord in the ſame notes in each part, or in the octave.

Let the intervals which conſtitute the octave be remembered, as hath been ſaid above (in p. 321.) namely, a 5th and 4th, a 6th and 3d, a 7th and 2d; taking care, that when the note of one part riſes or falls by one of theſe intervals, the note of the other part ſhould not fall or riſe by the interval which is the complement of the octave.

Thus the conſecution of 8ths will be eaſily avoided, and much trouble thereby ſaved in ſetting the parts.

Again, by the ſame caution, we avoid the conſecution of 5ths. For the notes ſet in the concord of a 5th, riſing and falling together in the different parts, by the ſame conſtituent intervals of the octave, will likewiſe meet in a 5th; and, by avoiding ſuch movement of the notes of a 4th, the conſecution of the ſame is in the ſame manner prevented.

One inſtance of each will ſhew this evidently. No. 65.

The conſecution of perfects, it is true, is tolerated, when effected by contrary motion of the parts. But theſe obſervations are made for the ſake of a beginner, that he may not too often incur the abuſe of this liberty.

The next obſervation is concerning the harmony of the 4th in a flat key.

The 4th in a flat key is either part of the concord of the flat 7th, or hath for harmony its own chord.

The harmonical figures over the examples point out this to ſight. Notwithſtanding, it may be aſked in what caſe either harmony is to be preferred.

We ſhall endeavour to aſcertain this matter upon the principles on which what hath been already taught is demonſtrated.

In page 430. col. 1. we deduced this general theorem; That the trueſt harmony is produced by the whole concords taken together, falling in ſucceſſion, as frequent as is conſiſtent with the approved rules of harmony, by a 5th.

Therefore, when a cloſe is made on the ſemitone, or flat 3d, the harmony of the 4th or immediately preceding note, muſt be the concord of the flat 7th. For thus the whole chord, or harmony, according to the foregoing theorem, falls a 5th.

And this theorem extends to the harmony of every note whoſe interval is a ſemitone, or which ſtands a half tone above and a whole tone below its contiguous notes, whoſe movement into the next chord muſt be falling a 5th.

The places of the ſemitone in the harmony of the key, are the key, the flat 3d, the 4th (in a ſharp key,) and the flat 6th, and not in the harmony of the key, whereſoever a ſemitone is introduced by the addition of a ſharp or flat, whereby a cloſe may be made on the ſemitone above.

Thus the truth of the firſt axiom of the practice is eſtabliſhed; where it is ſaid, That the harmony of every note in the compaſs of muſick, proved by the rules of harmony, is part of the concord of the key, or its 5th, or a ſemitone. For the flat 7th is to the flat 3d a 5th.

In the other caſe, when a cloſe is not made on the flat 3d, or when the harmony need not fall a 5th, then the 4th may have for harmony its own chord. And here the 4th ſtands generally in the baſs. Thus No. 66.

The proof of this depends on the relative proportion of the flat and ſharp keys; and will be given, by that analogy, under the article of tranſpoſition.

The laſt obſervation is in reſpect of the practice of authors of inſtrumental muſick, in compoſition of many parts.

Whereas in the compoſition of 7 and 8 parts, the harmony of the notes are doubled: this is effected by the common practice, after the moſt eaſy manner, by doubling whole parts; that is to ſay, by two alternate parts moving through every note in uniſon, when in full concert; and likewiſe other two alternate parts. Thus the firſt and third violins play in uniſon; and the ſecond and

and fourth. And, when these parts are not thus doubled, the third and fourth parts rest. Or otherwise, in some passages they take part of the harmony from the other parts, as in the examples above of 7 and 8 parts; excepting only in longer notes than the upper parts. The concertos of Corelli, Geminiani, and the overtures of Handel, are instances of this.

In a word, whatever form the parts of musick may be disposed in, the principles of harmony are the same.

And when the rules of composition in counterpoint, which is the ground-work, are well understood, and confirmed by practice, the remaining part will become easy in proportion as the composer will find himself more at liberty to dispose of the parts to such advantage as he will judge most suitable to the genius of the musick he is about to compose.

Chap. II. Of PLAIN DESCANT.

The second manner of composing is when the succession of concords is by notes of different lengths in the several parts. It differs from counterpoint, not in the principles of harmony, but only in the form.

The effect of descant is variety; which is produced, either when two or more notes of one part are set against one note in another, or when a long passage in one part is set against a single note in the other. This last manner is properly called descanting on that note. Or lastly, When a subject is set in the bass, and constantly repeated; while at every repetition of the same, there is a variation in the treble, which diversifies the harmony, but doth not deviate from the rules of art.

This bass, which is the first written part, is called a ground bass; and the piece of musick is called a ground.

Again, in descanting, it is usual for the parts to relieve each other; the bass sometimes holding the note, while the descant is in the treble; and again, the note is held in the treble, while the descant is in the bass.

The finest descant is where the discords are introduced in the passage of the notes. For here the air is less constrained; and the variety, in respect of the harmony, greater. This is figurate descant, which shall be treated of in the next chapter.

To return to plain descant: The movement of every part is more free than in counterpoint; and not so easy and unconstrained as in figurate descant. From this then arise its chief uses.

In the first place, it is the best introduction to the practitioner, to give an air to every part of his musick: It is also the ground-work of inventing variations in the treble upon a plain subject in the same part. The rules for plain descant are these.

Every note in the descant must be one of the harmony of each note in the bass; as demonstrated in composition in counterpoint.

Secondly, If the descant be variation on a given subject, in the treble, the original air must be preserved as much as possible in imitation of the same.

The harmony then being the same as in counterpoint, the difference being only in the form or length of the notes, one example, after so many given in counterpoint before, will be sufficient to illustrate this part. No. 67.

Whatever the subject of descant may be, whether a ground bass, or air in the treble, (the descant on which is called variations,) the practice is the same; as in the example, where the bass is the ground to the four trebles, the uppermost line of which may be called the air; and the other three descant on the bass; as well as variations on the subject, or first line.

For the more easy execution of both kinds, take these following rules of practice.

If you are to raise descant on a ground bass, then on this supposition the bass is first framed. Next let plain notes in the treble be set, as in the example, though no other use were to be made of them than to guide the composer's eye, and thereby furnish matter more readily for a better air and for the descant.

If the subject be an air in the treble, on which you are to make variations; as, in this case, the air is the first part written, so it is the object on the book to which you are to attend constantly as a pattern for the variations or descant.

It would be advisable also to set a plain bass to the treble or plain song, before you begin the variations. For, as the bass, or second note, in many cases determines the concord of the note; it thereby assists and rules the descant to be raised.

In general, when the two parts are set in plain harmony, the descant ought to imitate, and not depart from that design. If otherwise a discord be introduced in the composition of the two plain parts, or a discordant note be brought in in the treble or air, the descant must take part of the discord,

This properly belongs to figurate descant. Notwithstanding, it is an elegance common in practice, to throw in a discordant note in the variation, which is not in the plain song.

But these rules are addressed only to beginners.

Having done with plain descant, we shall here give an example of what hath been offered (p. 332. col. 1.) relating to the manner in which we would have the two basses set in composition of many parts; which is, That the part for the organ should move in long notes, and by the least intervals; the figures filling up the harmony and discord; while the part for the violoncello, moving by quicker notes, and greater intervals, becomes descant to the other bass.

The manner of setting the two basses depending on the principles of plain descant, and implying nothing more than what is contained in the last example, one instance of this will sufficiently answer our intention here.

Example of two basses in composition of many parts. No. 68.

The variety will be still greater if this manner be pursued in figurate descant. For as undoubtedly that is the best and most perfect composition where discord is intermixed; so there is no variety, which musick is capable of, produced from the form or disposition of the parts, that will not receive improvement from the more perfect composition.

The

The laſt example therefore, and what hath been ſaid of the two baſſes in plain deſcant, is meant as an introduction to a trial of the ſame in the more perfect, or figurate deſcant, both in the compoſition and performance.

Chap. III. Of FIGURATE DESCANT.

Figurate deſcant is the mixture of diſcord and concord, by notes of the ſame or different lengths or time, in the ſeveral parts.

Every interval in muſick which is not harmony, muſt be diſcord.

The diſcords therefore are ſix: namely, the leſſer and greater 2d; the ſharp 4th, or flat 5th; the leſſer and greater 7th; and the 9th. The reaſon for repeating the 9th, which is the 8th to the 2d, ſhall be ſhewn in its place.

The uſe of diſcord is twofold: To give a better air to every part of the muſick; and to create variety. For the diſcords ſtanding in the natural order of the notes, between the concords, afford an eaſy paſſage of the ſame; and, at the ſame time, mix with, and bind the harmony.

Diſcords are introduced in compoſition ſeveral ways.

Firſt, When the notes paſſing in the natural order, two, three, or more of one part are ſet againſt one of another part. This paſſage of the notes is ſaid to be by diminution; as in the following example.

Example of diſcords in paſſage by diminution. No. 69.

When the treble deſcends, the diſcords deſcend likewiſe into the concords; that is, the 9ths paſs into 8ths, the 7ths into 6ths, and ſo forth. The ſame thing happens when the baſs aſcends.

When the treble aſcends, or the baſs deſcends, the contrary happens; that is, the 2ds paſs into 3ds, and the 7ths into 8ths, or the diſcords into concords, according to the natural numbers.

When a ſingle diſcordant note is ſet, the change of that note into a concord is properly called the paſſage of the diſcord.

When the accompaniments are ſet along with the diſcordant note; that is, when the whole diſcord, either in compoſition of many parts, or in figures in the baſs, is expreſſed, the change of the ſame into a concord is juſtly called the reſolution of the diſcord. The paſſage of the diſcord in ſingle notes moving according to the natural order, as in the laſt example, is evident.

The accompaniments and reſolution of the whole diſcord depend on certain principles; on which we ſhall, in its place, demonſtrate the ſame.

To proceed, then, on ſingle diſcords.

The ſecond way in which diſcords are uſed in compoſition is, when the notes of each part move alternately, a long note between two ſhort ones, ſo that the note of one part breaks off and ends in the middle of the note of the other part. This is called ſyncopation or binding; for the frequent mixture of the diſcord here ſupports and binds the harmony;

As in this example. No. 70.

In this manner the air of either part is leſs conſtrained, by the conſtant return of the diſcord, and paſſage into the concord. In ſome places this happens by the natural ſucceſſion of the notes by diminution, as in the firſt example, though not ſo frequently as in the laſt manner by ſyncopation. But there is a paſſage of the diſcord into the concord, formed by the notes moving by greater intervals,

This muſick is preferable on account of the great variety produced by this unexpected, and, we may ſay, ſurpriſing mixture of the diſcord and harmony. For variety itſelf cauſes new pleaſure, when it is leaſt expected, or when attended by novelty.

This moving of the notes by greater intervals, is the third way of introducing diſcord; and is the effect of the diſcords and concords conſtantly meeting by contrary motion of the parts.

In this manner the variety ariſes from the paſſage into concords, different from thoſe which muſt ſucceed, either in the natural order of the notes, or by ſyncopation.

The variety alſo is greater by the conſtant ſucceſſion of diſcord and harmony almoſt through every note.

For here the compoſer is at liberty to paſs into any concord he pleaſes; and to reſume any diſcord. For as the paſſage into the perfect concords, between two parts, cannot be effected, but from the neareſt diſcord, when the notes move in the natural order; ſo, when the notes move by greater intervals, there is opportunity for many paſſages, which could not take place in any other way.

All this will be evident, when we come to underſtand the reſolution of the diſcords.

Example of the more perfect mixture of diſcord and harmony. No. 71.

In this example are ſet forth the two firſt ways of uſing diſcords; namely, by diminution and ſyncopation, as well as paſſing by greater intervals; being ſet according to the rules relative to each manner. Where the diſcord and harmony move by greater intervals, there the paſſage is from diſcords new and unpractiſed in the other two.

The compoſition, where this liberty is taken, does moſt juſtly challenge the name of ornamental or figurate deſcant.

And the muſick, wherein the diſcord is uſed theſe three ſeveral ways in their turn, muſt be eſteemed the beſt, as exhibiting greater variety than could be expreſſed the other ways only. Let it be remarked in this place, that this new paſſage of the diſcord is effected by both parts generally moving by a ſemitone; the power of which will be ſeeen when we ſhall have demonſtrated the accompaniments and reſolutions of the whole diſcord.

There is a fourth way wherein diſcords are admitted in compoſition. This is when diſcords ſucceed each other; or, where there is no paſſage into a concord. This is ſetting diſcords note againſt note. It is to be done two ways. Firſt, when the diſcord paſſes into one of another denomination, in the natural order of the notes, by contrary paſſage of the notes of each part, of the ſame or nearly equal quantity.

This paſſage of the diſcord is neceſſary, as we cannot aſcend or deſcend by the degrees of a great interval; but the intermediate diſcords will take place, and thence oft-times two will ſucceed each other.

This

This liberty is to be ufed chiefly in fhort notes, and by diminution.

Example of difcords fucceeding each other, or fet note againft note. No. 72.

Secondly, Difcords are admitted, note againft note, when the fame difcord is often repeated. This liberty is taken with the difcord of the flat 7th above all others; and is moft juftly practifed in mufick of three parts. When this difcord is brought in fucceffively in two parts, the complement of the chord ought to be written in the treble.

Example of the difcord of the flat 7th fucceffively. No. 73.

This example is taken out of the eleventh fonata of Corelli's fourth opera.

In this example, it is remarkable, that the firft and fecond trebles furnifh by turns the difcord to the bafs; which conftantly defcends by a 5th, while the intervals of the upper parts are 5ths and 4ths to the bafs alternately. Obferve, when the note in the bafs is flat, the difcord will be the fharp 7th.

The imitation of this paffage may be learned by infpection of the example. The demonftration depends on the demonftration of the third refolution of the difcords following; which we muft therefore referve for that place.

An example of this paffage fhall be given when we come to teach the ufe of difcords in mufick of three parts.

Having done with the fingle difcords and their paffages, we proceed, in the next place, to the complex ones; by which are meant the fame difcords with their accompanyments and refolutions.

Now, as, by axiom the fecond of the theory, from the natural order of notes, the properties, proportions and relations of founds, which arife out of their various combinations and fucceffions, are deduced; we fhall demonftrate the properties of the difcords upon the fame principle.

The firft property of the difcord is the notes which are to be played in the thorough bafs, in concert with the difcord. Thefe notes are called the accompaniments.

On the exact knowledge of thefe depends the fecond property of the difcord; namely, its paffage into a fucceeding concord.

This paffage is called the refolution of the difcord, as mentioned above.

Each difcord hath its own diftinct properties. Therefore the definition of difcord already given is juft; where it is faid, that difcord confifts in certain variable proportions of the diftance of founds,

As two fingle notes ftanding at a certain interval, form the difcord, fo they may eafily be refolved into the proper fucceeding concord, as we have already fhewn.

And on inftruments which have not keys, no more than the two notes can well be performed. Yet, as the refolutions of the difcords cannot be demonftrated without the knowledge of the accompaniments, we fhall confider the whole difcord together; and demonftrate the accompaniments of each particular difcord, after the fame method we have proved the harmony of each note of the octave in counterpoint.

Theorem. Since every interval in mufick is difcord or harmony, the accompaniments of moft difcords will be harmony in themfelves: for thus they will be difcord to the given note. But it will alfo happen, that fome note of the accompaniment in other cafes will alfo be harmony to the given note, yet the whole accompaniment difcord in itfelf. For the foul fo accords with harmony, as not to bear an entire perfect difcord.

Now, as more or lefs of difcord with the given note prevails; fo the difcords are naturally divided into proper and inharmonic.

A proper difcord is the concord of fome member of itfelf, and only difcord in part with the bafs or given note.

An inharmonic difcord is an abfolute difcord in itfelf, and partly concord to the bafs or given note.

There are five proper difcords; namely, the leffer and greater 2d, the fharp 4th (or flat 5th,) the fharp 7th, and the 9th.

There is one inharmonic difcord; which is, the flat 7th. It hath three places in the compafs of the octave; where it appears in three different forms.

It is called inharmonic; not only becaufe it is an abfolute difcord in itfelf, but alfo becaufe it is not the accompaniment to the bafs note, from whence the order of the difcords is traced in the natural feries; except in one place or form, which is the fecond; wherein the flat 7th is the uppermoft note of the chord. This will be feen moft clearly, when we fhall have gone through the difcords of each kind in their natural order, in the table of difcord and harmony. No. 82.

We proceed therefore to the demonftration of the difcords. And, according to the 2d axiom of the theory, fhall begin with the demonftration of the accompaniments of the 2d.

As in the demonftration of the concords we begin with the key-note, which we confidered as an immoveable point, from whence our calculations were to proceed; fo we fhall here confider the bafs, or lower-note of the difcord, that immoveable point; and the upper difcordant note the interval in queftion, whofe properties are to be found.

Demonftration of the accompaniments of the 2d.

The accompaniments of the 2d are the 4th and 6th to the bafs or given note, or the difcord of the 2d is the concord of the fame.

The 2d is a proper difcord: Therefore the accompaniments of the 2d are its 3d and 5th. But the 3d and 5th to the 2d, or difcordant note, are to the given note the 4th and 6th; therefore, the accompaniments of the 2d are the 4th and 6th.

Example of the firft difcord, or difcord of the 2d. No. 74.

Proper difcord.

The difcord of the 2d muft be a proper difcord: for the 3d and 5th to the bafs with the 2d would be intolerable difcord, feeing they are three notes in the natural order, and the 5th and 7th is the harmony of the 2d; therefore they muft be the 6th and 8th, which is the gi-

ven note: But the 6th will have the 4th; therefore the difcord of the 2d is a proper difcord.

By the 2d axiom of the theory, the properties, proportions and relation of founds are deduced from the natural order of the fame. Which axiom is extended to the difcords, as they are combined of the natural notes, and differ from the concords only in form.

On this axiom, then, we are to inveftigate the next fucceeding difcord. The 2d difcord is the 2d, 4th, and fharp 7th to the given note. For thefe are the next fucceeding difcordant notes.

Demonftration of the fecond difcord.

The 2d and 4th cannot have the flat 7th; for they are harmony, or concord of the flat 7th; and the 8th is the given note: therefore it remains, that the fecond difcord is the 2d, 4th, and fharp 7th to the given note.

Example of the fecond difcord. No. 75.

Inharmonic difcord.

This is an inharmonic difcord; being an abfolute difcord in itfelf. It hath but one concording note with the bafs; which is the 4th. This 4th is the flat 7th to the given note's 5th: which 5th is the bafs to this difcord; the given note in this place being confidered only as a point, or unity, from which we are to inveftigate the next difcordant notes, according to the 2d axiom.

The property of this inharmonic difcord, or flat 7th, is, that its own difcordant interval, or that which is formed by the accompaniment, is always a fharp 4th, or flat 5th, which diftinguifhes it at fight from every other difcord. And every inharmonic, where-ever found, hath the fame property. The refolution alfo of every inharmonic is the fame; as we fhall fee, when we come, in the next place, to fhew the refolutions of the difcords.

The next difcord, according to the 2d axiom, is the fharp 3d, 5th, and flat 7th to the given note. This is alfo an inharmonic, or flat 7th; and having the fame property with the former, namely, the flat 5th, muft not be accounted a new difcord. No. 76.

Inharmonic difcord.

This is the inharmonic difcord in that form, whofe accompaniments are relative to the bafs, or given note.

The third difcord is the 3d, 5th, and fharp 7th to the bafs, or given note.

Demonftration of the third difcord.

The fharp 3d, 5th, and fharp 7th, muft conftitute the next difcord. For the flat 3d, 5th, and flat 7th, are harmony, or concord of the flat 3d; and the 8th with the 3d and 5th, are the chord of the bafs note; and the flat 7th, with the fharp 3d and 5th, are the inharmonic laft mentioned; therefore, the fharp 3d, 5th, and fharp 7th, are the 3d difcord.

Example of the third difcord. No. 77.

Proper difcord.

This is a proper difcord, being the concord of the 3d to the bafs; and the fharp 7th the difcordant note.

To proceed then according to our 2d axiom, the next difcordant notes in order, are the 4th, 6th, and 9th: But thefe being the notes which conftitute the firft difcord, varying only in place and name of the 9th, for the 2d, are in effect the fame difcord.

The next fucceffive difcordant notes are, according to our well known axiom, the 4th, fharp 7th, and 9th. But thefe likewife conftitute the 2d difcord in like manner, as was faid in the former cafe; and therefore cannot be reckoned a new difcord.

To proceed then by our axiom: The next afcending notes, by the fmalleft intervals, are the fharp 4th, 6th, and 8th. This is an inharmonic, or flat 7th; its flat 5th being formed by the fharp 4th and 8th; therefore no new difcord. No. 78.

To go on, the next difcordant notes will be found the fharp 4th, 6th, and 9th.

Demonftration of the fourth difcord.

From the proof of the laft inharmonic difcord, the fharp 4th and 6th can form a proper difcord with no other interval but the 9th; for the 7th would produce three notes in the natural order, and intolerable difcord. Therefore the fourth difcord is the fharp 4th, 6th, and 9th.

Example of the fourth difcord. No. 79.

This is a proper difcord, being a concord in itfelf, and only difcordant to the bafs note. The difcordant notes of it are the fharp 4th and 9th.

The next which prefents itfelf, is the 5th, fharp 7th, and 9th, by the fame axiom.

Demonftration of the fifth difcord.

The 5th will admit no other difcordant notes but the fharp 7th and 9th. For the 8th and 10th make the concord of the bafs note; and the fharp 7th and 10th is, with the 5th, the third difcord already proved: and any other note would be double difcord, and intolerable: therefore, the fifth difcord is the 5th, fharp 7th, and 9th.

Example of the fifth difcord. No. 80.

Proper difcord.

This is a proper difcord, being a concord in itfelf; and difcordant only with the given note. Its difcordant notes are the 7th and 9th.

We have purpofely referved the difcord of the leffer 2d to the fixth and laft place, 1ft, Becaufe, as the interval next above the key is always a whole tone, we cannot, according to our 2d axiom, erect this difcord as relative to the given note, or key; as we have done the other five. 2dly, The refolution of this difcord will be found different from that of the greater fecond; for reafons which will abundantly appear, when we fpeak of the refolutions. This difcord may properly be called the difcord of the femitone.

Demonftration of the difcord of the femitone.

The difcord of the femitone, or leffer 2d, is, like that of the greater 2d, or whole tone, the 2d, 4th, and 6th. The demonftration is the fame as that of the greater 2d, and therefore need not be repeated here.

Example of the fixth difcord. No. 81.

This is a proper difcord, like that of the greater 2d, being

being a concord id itſelf. Its note diſcordant with the baſs is the 2d.

It hath been ſaid, that all harmony is divided between the flat and ſharp keys.

The mixture of diſcord and harmony enables us to extend the like obſervation in this place much further.

Hence the following corollary.

The compoſition of all muſick, of any number of parts whatever, is divided between the harmony of the flat and ſharp keys, and the juſt mixture of diſcord with it.

To illuſtrate theſe truths, we ſhall ſet in one view every concord and diſcord, in the whole compaſs of muſick, in their natural order. No. 82.

Hence we ſhall derive ſome uſeful corollaries, which will lead us to diſcover what is next to be conſidered, the ſecond property of the diſcords, or their reſolutions into the concords.

The manner of reading this is as follows:

This concord is the concord of the key.

This concord is the concord of the 2d to the key, or given note.

This concord is the concord of the flat 7th.

This diſcord is inharmonic, and ſo forth: deſcending ſtill from the uppermoſt lines of harmony, or diſcord, to the loweſt line, or baſs.

In this view is ſeen the mixture of diſcord with harmony, each in the natural order. Wherein, indeed, nothing regular or proportioned appears to ſight. The reaſon of this is evident from the demonſtration of the harmonical proportions. For, if they be of a ſpecies different from all other proportions, as by corollary 2d of the theory, and muſt be demonſtrated on principles peculiar to them; then the ſucceſſion of the diſcords, conſtantly taking place between the intervals of harmony, muſt be diſproportioned too. This appears to ſight in the next example, or view of harmony and diſcord in the natural order. No. 82.

However irregular this may ſeem, an uniformity prevails through the whole, which ſupports that variety in muſick ſo deſirable: Without which variety, there could have been but one concord among ſounds; a ſameneſs prevailing through the whole; without ſemitone, and conſequently without diſcord. In this caſe, muſick never could have exiſted as an object of pleaſure to the ſenſe; much leſs of ſcience.

This admirable ſtructure is raiſed on the power and property of the ſemitone, which ſhall be the ſubject of the following corollaries.

Cor. I. Every ſemitone in the octave hath either a concord or diſcord proper and peculiar to itſelf. Yet, the natural ſucceſſion of the concords and diſcords is not according to the aſcending and deſcending ſemitones. For, it is evident, in the annexed table, that the correſponding baſs notes conſtantly deſcend by 3ds, the variety, at the ſame time, ſhining throughout the harmony and diſcord in the upper parts, aſcending by ſemitones. Yet the baſs expreſſes every ſemitone in its paſſage by 3ds, uniformly to its period.

This moſt ſtrongly illuſtrates the truth of the 4th axiom of the theory; namely, that the concords and diſcords, either in their natural order, or arranged by art, will not ſuffer us to depart from the eſtabliſhed precept of variety amidſt uniformity.

The ſame uniformity, or rather unity, is exhibited ſtill more plainly in the 5th diſcord, in the coincidence of diſcord and harmony in the ſame individual ſounds.

For this diſcord, which is the diſcord of the 9th, is alſo the harmony of the 5th.

This is truly admirable, and furniſhes us with the moſt intereſting remark in the compaſs of muſick, as in the following corollary.

Cor. II. The ſcope of muſick, and motion of the parts, muſt at length terminate, and meet in one invariable thing Harmony.

Thus are we arrived at the full extent, or bounds of muſick. It it is fit we now return to make ſuch further obſervations as will lead us to the knowledge of the reſolutions of the diſcords, which is the next thing to be ſpoken to.

The diviſion of diſcords into proper and inharmonic, we have made for the ſake of clearneſs and method. The difference already pointed out between the diſcords muſt be remembered; which is, that the property of the inharmonic, or flat 7th, (which note does ever, with another note of the chord, frame the ſharp 4th, or flat 5th) is the ſame, in whatever place or form it is met with; whereas the proper diſcords eſſentially differ from each other, and in every particular.

The three inharmonic therefore, in the natural order of the diſcords, are not ſo properly three, as the ſame diſcord in different light; where it is a preparation for a cloſe on the key, and on the 4th and 5th to the key.

The baſs to the diſcords moves by 3ds deſcending in a ſharp key.

The notes of the baſs, correſponding to the proportions of the flat key, have no relation to the diſcords in the line next above; but are the baſs to the concords in the flat key, as demonſtrated in the rules of harmony.

The two diſcords, which are a repetition of the firſt and ſecond, are ſet down in compliance with the 2d axiom, to purſue the natural order. And hence they ſerve to demonſtrate there can be no other diſcord than thoſe exemplified in the ſcheme. For there is no ſemitone in the octave which doth not appear there to have its diſcord or harmony connected with it.

In this ſcheme then is compriſed every interval of muſick, with the members of each chord reſpectively, both diſcord and harmony, in the natural order.

From the ſame order, we ſhall demonſtrate the paſſage of the diſcords, into the concords or reſolutions of the ſame.

In the theory, it hath been ſaid, that the ſemitone is the principle or hinge, on which turns the reſolution of every diſcord.

On this principle, then, we ſhall now demonſtrate the ſame.

The diſcords ſtand in the natural order between the concords; but every note of the chord is not equally near reſpectively.

From the idea of harmony, which is fitneſs or propor-

tion,

tion, the paſſage of the diſcord muſt be to the neareſt concord; therefore, the reſolution will be by the ſmalleſt interval, that is, by the ſemitone.

This is the general theorem for the reſolution of every diſcord. We will now apply it,

The reſolution of the diſcord of the 2d is into the concord of the given note.

The 4th, or ſemitone, will move into the 3d, but the 3d will have for harmony its 3d; therefore, the 6th muſt deſcend into the 5th, and the 2d's paſſage by the neareſt interval will be into the given note. By theſe paſſages is formed the chord of the ſame; therefore, the reſolution of the diſcord of the 2d is into the concord of the given note.

In a flat key, there are two paſſages by ſemitones; that of the flat 6th into the 5th, and of the 2d aſcending, by contrary motion, into the 3d.

Example of the reſolution of the diſcord of the 2d, or firſt diſcord. No. 83.

Proper diſcord.

The reſolution of this diſcord being into the given note, the baſs does not move.

The reſolution of the ſecond diſcord is into the concord of the given note.

The ſecond diſcord is the 2d, 4th, and ſharp 7th. The ſharp 7th and 4th move by the ſemitones and contrary motion into the 8th and 3d, while the 2d falls a 5th into the 5th. Theſe are the concord of the give note: therefore the reſolution of this diſcord is into the concord of the given note.

Example of the reſolution of the ſecond diſcord being inharmonic. No. 84.

Inharmonic diſcord.

The reſolution of this diſcord being into the concord of the given note, the baſs aſcends by a ſemitone.

The paſſage of this inharmonic by contrary motion of two ſemitones, and the other note falling a 5th, is the reſolution of every inharmonic, where-ever introduced. This therefore needs no repetition. But if the ſucceeding concord has a flat 3d, the paſſage is by two aſcending ſemitones; the 2d riſing into the 3d, the 7th into the 8th, and the 4th by a whole tone into the 5th. This movement can only happen in the reſolution into the key.

The other, of much more extenſive uſe, is the true reſolution of the inharmonic diſcord; and more intereſting, as, by its contrary motion of the ſemitones, it better binds the harmony.

It is neceſſary here to explain further the nature of the inharmonic diſcord.

The inharmonic diſcord, then, is always the chord in a ſharp 3d, with a flat 7th; which two notes frame the interval which characteriſes this chord, namely, the ſharp 4th, or flat 5th: when the flat 7th is the upper note of the two, the interval is the flat 5th; when the ſharp 3d is the upper note, the ſame interval is called the ſharp 4th. Theſe notes being relative to the fundamental note either of them determine the chord.

As the inharmonic is found in different places of the octave, ſo conſequently the note of the chord muſt vary accordingly; the ſecond inharmonic therefore only, in the natural order, hath reference to the given note in the table, as that happens to be the note of the chord. For the given note there is to be accounted only a point or unity, from whence we proceeded to trace the diſcords in their natural order, as they lie between the concords. The chord note, therefore, of the firſt inharmonic is the 5th to the given note; and of the laſt inharmonic, it is the 2d to the ſame. Now, as the whole chord falls a 5th in the reſolution, ſo the firſt is a preparation for a cloſe on the key, the ſecond for a cloſe on the 4th, and the laſt for a cloſe on the 5th; now, as any note of the chord may ſtand in the baſs, ſo the third is often preferred before the chord note, for the ſake of the movement of the baſs by a ſemitone, as well as becauſe falling a 5th in the baſs is more properly the part of harmony.

The flat 7th is likewiſe choſen for the baſs note; for the ſame reaſon, the movement of the baſs by a ſemitone deſcending; which is no inconſiderable uſe of diſcords. For in figurate deſcant, as we have ſaid, all the parts move more freely.

The next diſcord is likewiſe inharmonic. It is the ſharp 3d, 5th, and flat 7th to the given note; which note is likewiſe that of the chord. No. 85.

Note, the reſolution of every inharmonic being into its 5th below the chord, the reſolution of this will be into the 4th of the given note; as riſing a 4th, and falling a 5th, anſwers the ſame thing in eſtimating the intervals of harmony.

Inharmonic diſcord.

Example of the ſecond inharmonic diſcord and its reſolution: here the baſs note is the note of the chord; therefore, in the reſolution it falls a 5th, which is the 4th to the given note.

The flat 7th deſcends by a ſemitone into the 3d, the 3d riſes by a ſemitone into the 8th, and the 5th falls a 5th into the 5th of the concord. The reſolution therefore is into the 4th of the key.

This is that form of the inharmonic diſcord on which the compoſition of the paſſage taken out of Corelli, (No. 73.) is grounded. Obſerve, that in the cited paſſage, and alſo in every like paſſage, the two notes of the baſs move to only one note of the ſecond part, which becomes the flat 7th by this movement of the baſs.

Thus the flat 7th is given, in the upper parts by turns, to every note in the baſs, as hath been before remarked.

Reſolution of the third diſcord.

The third diſcord is the 3d, 5th, and ſharp 7th, to the given note; it is reſolved into the 6th to the ſame. For the 7th aſcends into the 8th or 6th's 3d, the 5th riſes a whole tone into the 6th, and the 3d not moving becomes the 5th. The reſolution of this diſcord therefore is into the chord of the 6th.

Example of the reſolution of the third diſcord. No. 86.

Proper diſcord.

This is a proper diſcord; in the reſolution of which the baſs falls a 3d, while the whole diſcord falls a fifth.

The

The next discord is the sharp 4th, 6th, and 8th. It is inharmonic. Its resolution is into the chord of the given note's 5th. No. 87.

Resolution of the third inharmonic discord.

Of this discord the bass note is the flat 7th; it descends by a semitone, while the whole chord falls a 5th.

Inharmonic discord.

Its resolution is the same as that of every inharmonic, in what form soever, by the contrary motion of the two semitones, while the third note falls a 5th.

Resolution of the fourth discord.

The fourth discord is the sharp 4th, 6th, and 9th. Its resolution is likewise into the chord of the note's 5th.

For the sharp 4th ascends into the succeeding concord's 8th, the 6th passes into the 3d, and the 9th not moving becomes the 5th. Those are the chord of the note's 5th.

Example of the resolution of the fourth discord. No. 88.

Proper discord.

This discord is a mixture of the proper and inharmonic. It is a proper discord, for that the notes of the treble are concord; and inharmonic, in respect of the bass, with which it makes the discord of the sharp 4th.

It differs from the foregoing, where the flat 7th is expressed in both treble and bass; whereas, in this, it is only in the bass.

The bass here also descends by a semitone, while the chord falls a 5th.

Resolution of the fifth discord.

The fifth discord is the 5th, sharp 7th, and 9th. It is resolved into the concord of the bass note.

For the 5th is that note's 5th; the sharp 7th ascends by a semitone into the 8th; and the 9th (or 2d) passes into the 3d. Thus it is resolved into the chord of the given, or bass note.

Example of the resolution of the fifth discord. No. 89.

Proper discord.

In this resolution the whole chord falls a 5th, while the bass stands still, or descends into the octave.

This is plainly the last discord in the order of sounds. Its resolution is into the given note or key, by the passage of the great cadence, or descent by a 5th. It is a concord in itself; and is in harmony the concord of the 5th.

In this chord discord and harmony are united. When it stands in discord with the bass, the bass doth not move in the resolution; when it sounds perfect harmony with the bass, then the bass descends a 5th.

Therefore we conclude, Harmony and discord are like two finite lines, whose beginnings are at a certain distance; and in the natural progression converge constantly, until they meet in a point.

The discord, which we have reserved to the sixth place, is that of the lesser 2d, or semitone.

Its places in a flat key are the 3d and 6th; and in a sharp key the 4th and 8th, or where-ever a new semitone is introduced.

It is a proper discord, being a concord in itself, whose chord hath always a sharp 3d.

Its properties are everywhere alike; but its resolution differs from that of the greater 2d, for the reason assigned in the resolution of every discord; that is, the passage by the semitone.

Resolution of the lesser 2d, or semitone.

The discord of the lesser 2d is the 2d, 4th, and 6th to the bass; or, the concord of itself.

Its resolution is into the concord of its own 3d or 5th. It rises into the concord of its 3d by the single passage of the semitone descending. And into the concord of its 5th by the 4th descending along with the semitone.

Example of the resolution of the discord of the semitone. No. 90.

In the first resolution, the chord rises a 3d, and the bass falls a 5th. In the second, the chord rises a 5th, and the bass falls a 3d, the reverse of the former.

From the resolutions of the discords we derive the following corollaries.

Cor. I. There is no interval of harmony that is performed by the bass in the resolution of one discord or another.

Hence we may conceive that harmony regulates even the discords, and presides in every part of musick.

Cor. II. The inharmonic discord, or flat 7th, is a preparation to a close on a key, the 4th and 5th, flat 3d and flat 6th; for into the harmony of these it is resolved; they being the intervals on which closes may be made according to the established rules of melody. And universally, wheresoever a close may be made by introducing a new semitone, the preparation may be made by the flat 7th, or inharmonic discord.

This discord, being of such extensive use, will deserve some further remarks, which may render the setting of the same more easy, and assist the performer in the taking and resolution of it.

In the inharmonic discord, then, are three notes chiefly concerned, which are the note of the concord; its 3d, (which is always sharp;) and the flat 7th: either of these may be set in the bass. Hence there will arise three varieties.

If the note of the chord be the bass note, the figure is the flat 7th; the chord is that of the same note; and the bass falls a 5th.

Secondly, When the 3d is the bass note, the figures are flat 5th and 6th; the chord is that of the 6th to the same 3d; and the bass ascends by a semitone.

Thirdly, If the flat 7th stand in the bass, the figures are the sharp 4th, 6th, and 9th; the chord is that of the 2d to the bass note; and the bass descends by a semitone.

Example. No. 91.

The 5th of the chord may likewise stand in the bass; but as the movement of the same is by a whole tone descending, it is very seldom used.

The figures are sharp 6th. flat 3d.

Cor. III. Hence the baſs aſcending or deſcending by a ſemitone, furniſhes an opportunity of introducing notes in the upper parts, which will conſtitute the inharmonic diſcord.

And again, the ſharp 3d of any chord in the treble, or any note having the addition of a ſharp, and thereby becoming the greater 7th, may be the 3d of an inharmonic; the baſs taking the flat 7th. For the ſharp 3d of the chord, (which is the ſharp 4th to the flat 7th in the baſs, or elſewhere,) and the flat 7th, in whatſoever part they are ſet, in baſs or treble, or both in the treble, conſtantly move each his own way; the firſt aſcending, and the latter deſcending by a ſemitone.

Theſe are the ſimple diſcords as they are found to lie in the natural order of ſounds between the concords; whoſe accompaniments are, for the moſt part, harmony among themſelves. It is evident, from the method in which we traced them, that there is no other diſcord among ſounds. Notwithſtanding, from the combination of two ſimple diſcords, a new form of diſcord may be framed, which taketh part of the inharmonic and diſcord of the ſemitone; which, therefore, we call the compound diſcord.

This diſcord is the ſharp 3d, flat 7th, and flat 2d, or ſemitone to any note whoſe chord hath a ſharp 3d.

It is reſolved, by the paſſage of three ſemitones, two deſcending, and one aſcending, into any concord with a ſharp 3d; and therefore may be introduced as a preparation to any concord, in either flat or ſharp key, where the greater 3d is.

Example of the compound diſcord, and its reſolution. No. 92.

The reſolution of this diſcord, as it is compounded of the diſcords of the flat 7th, and ſemitone, will partake of the reſolution of the ſame. Thus the upper note, or ſemitone, deſcends into the 5th of the concord; and the flat 7th and 3d meet by contrary paſſage of a ſemitone each into the 3d and 8th part of the reſolution of every inharmonic, while the baſs deſcends a 5th. Thus the paſſage into every note of the concord is by a ſemitone; ſo great a favourite of nature is the ſemitone.

By changing the form of this diſcord, it will be reſolved into a chord with a flat 3d, by one ſemitone deſcending, and two aſcending; the two extreme notes of which are the ſame as in the example above; but the middle note is the 5th aſcending into the 3d, inſtead of the flat 7th deſcending. The upper notes therefore form the flat 5th, or inharmonic interval. No. 93.

The properties of thoſe diſcords, and of the inharmonic, furniſh us with ſome practical obſervations; which are, that the two diſcordant notes of theſe diſcords are, in muſick of two parts, a preparation to, or paſs by contrary motion of the ſemitones into the concords of the ſharp 3d, flat 6th, and 5th. When the flat 7th is the uppermoſt note, and the lower the ſharp 3d, they paſs into a ſharp 3d.

When the upper note is the ſharp 3d, and the flat 7th is below, they paſs into the flat 6th; ſo do likewiſe the flat 7th above, and the chord note below.

Laſtly, the two extreme notes of the compound diſcord paſs into the concord of the 5th.

Example of the paſſage of diſcords in muſick of two parts. No. 94.

In like manner there is a paſſage into the octave from a diſcordant interval; the upper note of which is part of a concord, and the lower the ſemitone of the compound diſcord. No. 95. Or the contrary.

There is no paſſage by two ſemitones into the flat 3d and ſharp 6th from any diſcordant interval, except the ſemitone. For, in the paſſage of quick notes encountering each other by contrary motion, this, or any other diſcordant interval, may fall into the concords. But ſuch, being tolerated only for their quickneſs, need not be reduced, as indeed they cannot, to any rules of art.

Laſtly, the baſs will admit two notes together, each concording with it, namely, the 5th and 6th, and making a diſcord between themſelves.

This diſcord, which differs from the proper and inharmonic, is rightly called the mixed diſcord; each of the two notes being in harmony with the baſs, and diſcordant to each other.

The framing of this diſcord depends upon the rules of harmony, and may be ſet to any note of the baſs which hath for harmony its own concord, and is likewiſe the member of another.

Therefore, in the ſharp key, the key and 5th, and in the flat key, the key 3d, 5th, and flat 7th, admit a 5th and 6th.

When we ſhall have proved, under the article of tranſpoſition, the 4th in a flat key, and 6th in a ſharp key, to have their own concord; they will be found, no doubt, to have the privilege of admitting a 5th and 6th.

For thus it is underſtood. The key hath a 5th in its own right, and a 6th as member of the 4th.

The 5th hath a 5th in its own right, and a 6th as member of the key.

The flat 3d hath a 5th in his own right, and a 6th as member of the key.

The flat 7th hath a 5th in his own right, and a 6th as member of the 3d.

Thus the 5th and 6th will ſtand together to the baſs.

The properties of ſounds in the natural order may be transferred by art, and improved into all the variety poſſible; as this is no other than an imitation of nature.

Hence we infer, that every note, which aſſumes the nature of the key, by the addition of the greater 7th, will admit a 5th and 6th.

This 5th is eaſily diſtinguiſhed from the 5th of the inharmonic, which is always an imperfect one, and ought conſtantly to have a flat prefixed.

Now the chord of the inharmonic with a flat 5th is that of the 6th to the baſs note, as hath been ſaid. But the chord of the mixt diſcord may be better underſtood to be the chord of the baſs note, with a 6th added.

Sect. 2. *Of* Figuring *the* Bass.

Having delivered all that hath fallen under our obſervation concerning the nature, proportion, and uſe of diſcord; we ſhall now make an application of the ſame, in order to explain the figuring of the baſs; the next article propoſed to be ſpoken to.

Firſt, Of figuring the concords.

That

That the notes whofe harmony is their own chords, need no figures, is evident from the definition of harmony; which confifts of one certain, invariable proportion of founds.

Thefe are the key, flat 3d, 4th of a fharp key, 5th, flat 6th, flat 7th.

They which, as members of other chords, require the figures of harmony fet over them, are thefe following; and are reduced to this general rule:

The 3d of every concord hath a $\frac{6}{3}$; and the 5th of every concord hath a $\frac{6}{4}$.

Therefore, And thefe,

$$\left.\begin{array}{l}\text{Key}\\ \text{Flat 3d and fharp}\\ \text{5th of a flat key}\\ \text{Flat 6th and fharp}\\ \text{Sharp 7th}\end{array}\right\}\begin{array}{c}\text{have a}\\ \frac{6}{3}\end{array} \left\{\begin{array}{l}\text{Key 2d}\\ \text{Flat 3d and fharp}\\ \text{4th of a flat key}\\ \text{5th of a fharp key}\\ \text{Flat 7th}\end{array}\right\}\begin{array}{c}\text{have a}\\ \frac{6}{4}\end{array}$$

Laftly, The 4th in a flat key, when it has its own chord, muft have a 5th fet over it, to diftinguifh the chord from that of the flat 7th. And the 6th in the fharp key, when it hath its own chord, muft have a 5th likewife fet over it, to diftinguifh the chord from that of the 4th.

The proof of the 6th in a fharp key, having for harmony its own concord, depends on the relative proportion of the flat and fharp keys; as will be fhewn in the chapter on tranfpofition. So much for figuring the bafs in concords.

Let us now inquire into the fhorteft and cleareft method of figuring the difcords. This will be no difficult matter, when we confider well the whole difcords, as they are full figured in every example.

There the figures fet over the bafs exprefs the intervals which the notes in the upper parts form with them. Thefe taken together make the whole difcord. And as thefe, with the harmonic chords in fucceffion, exprefs the whole compofition, they are therefore called the thorough-bafs.

To render the performance of the thorough-bafs eafy and expeditious being the chief intention of figuring the bafs; this will be beft anfwered by diftinguifhing the difcords, which have fome figures in common with each other, by fuch figures only as will ftrongly mark each difcord. For though all the figures fet down in the examples be neceffary to demonftrate the properties of the difcords, and truth of the compofition; the cafe is quite otherwife in refpect to the fight; many marks caufing perplexity and confufion, when one fingle mark in this, as in all other cafes, beft difcovers the difference. The proper difcords then being concords in themfelves, the figure, or figures, difcording with the bafs note, will diftinguifh each of thefe.

The inharmonic difcords being the fame in different form, will be diftinguifhed by the difcording figures peculiar to each form.

Of the properties of this difcord, and manner of taking the fame, we have fpoken fufficiently. We fhall therefore only fet down the difcording figures of each form, in the following example.

Example of the proper difcords figured for taking the fame at fight. No. 96.

The inharmonic difcords figured for taking the fame at fight. No. 97.

Moreover, the proper difcords being concords, each in itfelf; every difcord will be concord to fome note different from the bafs, or difcordant note.

To remember this note will render the taking of this difcord ready at fight, it appearing in this light a chord of harmony.

The fame is in fome meafure true of the inharmonic difcord.

Therefore the figures in the examples, under the bafs lines, exprefs the names of thefe concords relative to each.

It remains to be obferved, that the accompaniments of the 2d are the $\frac{6}{4}$, and of the 9th the fharp $\frac{7}{5}$, as they appear in the natural order of the proportion of the fame, (No. 82.). It will be neceffary to demonftrate here the truth of this.

The 4th and 6th being the accompaniments of the 2d, the fifth and fharp 7th are the accompaniments of the 9th.

For the proportion of the 9th to the 2d (whofe 8th it is) is 2 to 1. And the proportion of the 4th and 6th $\frac{15}{12}$. Therefore, by the rule of proportion, fay,

$$\text{as } 1 : \tfrac{15}{12} :: 2 : \tfrac{30}{24} :$$

but the 4th number, or $\frac{30}{24}$, is the proportion of the 5th and fharp 7th; (for $\frac{3}{2}$ $\frac{15}{8}$, give $\frac{30}{24}$;) therefore the 5th, and fharp 7th, are the accompaniments of the 9th. Q, E, D.

The laft ufe we fhall mention of the difcord is the furnifhing the inward parts of mufick, in compofition of many parts.

As, in harmony, each part of the four takes one of the concording notes, and hence, by the continual mixture of thefe by their contrary motion, the compofition is framed; fo, in figurate defcant, the notes of the difcord furnifh the parts in their turn.

And the fame notes, paffing by femitones chiefly, form among themfelves that refolution which the bafs performs alone.

The compofer therefore, when, fetting a bafs, he introduces a difcord, is as well prepared for the notes of the other parts in this cafe as in fetting a concord; and if he be well fkilled in the refolutions, will with great eafe compofe the fucceeding concord.

For the thorough bafs, being the whole compofition in one view, the knowledge of the one and of the other muft be the fame. As, then, he who underftands the rules of harmony and the difcords, and their refolutions, will fucceed with eafe in compofition; fo, on the other hand, he cannot be a fkilful compofer who is ignorant of the properties of harmonical chords and difcords.

One example in three parts, being the fame fet above in two, will fufficiently illuftrate this.

Example of the ufe of difcord in the compofition of many parts. No. 98.

Chap. IV. Of MELODY.

Hitherto we have confidered mufick in its feveral parts taken together, or the art of compofition. Our next bufinefs will be inquire into the method of framing a fingle part, or making the melody.

Melody.

Melody is the air of the uppermoſt or firſt part in muſick, commonly called the tune.

In a plain ſong, the air is formed without conſidering the relation which the other parts, which may be ſet in compoſition with it, may bear. For, being firſt framed, and for the ſole end of pleaſing the ear and fancy; it muſt, it is evident, be independent of them.

For as to framing the baſs firſt, and ſetting the treble to it, there appears no neceſſity either in reaſon or the rules of compoſition; they equally ſerving the purpoſe of beginning with any part, no part being privileged with any particular member of diſcord or harmony; as is abundantly manifeſt from the various poſitions which the diſcordant notes have been ſhewn to ſtand in; as well as from the 4th axiom of the theory, which eſtabliſhes variety for conducting and rendering even harmony acceptable; a ſameneſs in the ſucceſſive concords being the only thing exceptionable in that part of compoſition.

All the parts of muſick then being equally concerned in the compoſition; to prefer any one part, as a baſis, or unerring guide, on which to erect the muſick, or bring in the parts, is doing injury to that liberty which nature and the rules of art put us in poſſeſſion of.

But the air of the firſt part ſo eſſential to the tune, or rather the tune itſelf, compels us to decide in favour of framing the treble firſt. In which it will be found impoſſible to ſucceed, when it is confined to what the baſs, if it be firſt framed, muſt of neceſſity preſcribe.

This preference in framing the treble firſt, chiefly reſpects a plain ſong, or air. For, in more elaborate pieces, where the deſign of the author is imitation of paſſages in the ſeveral parts by turns, according to his choice or fancy making uſe of the ſame liberty, he will take any for the leading part, and accordingly write the paſſage in that part, and finiſh the compoſition in the reſt.

The air or firſt part in inſtrumental muſick is called the firſt treble; the air for a ſingle voice is called the voice part, or ſong; and in muſick for many voices, the upper part is called the counter-tenor.

In this muſick, the air of the tenor, and of every part performed by the voice, is ſtudied with more exactneſs than the inward parts of inſtrumental muſick.

The reaſon for this difference is, that in inſtrumental muſick, the firſt violin generally preſides, or leads the muſick by its air: as this is the compoſer's deſign, the other parts muſt of neceſſity be accommodated to it.

Whereas in muſick for voices, every voice repeating the ſame words, that is, expreſſing the ſame ſenſe, at the ſame time, or immediately ſucceeding; nothing can defeat the end of the muſick ſo much, which is the ſetting of words, or rather ſentiments, to notes as expreſſive of the ſenſe as inarticulate ſounds can poſſibly do, as for one part to excel the others ſo much in this neceſſary point, as by compariſon to depreciate, weaken, or alter the ſenſe in the others.

The air, therefore, of every part in vocal muſick muſt be conſulted; not only for the ſake of harmony, (for a good air in each part improves even the harmony;) but alſo for the ſentiment ſake, without which the muſick muſt be abſurd and diſſonant.

Notwithſtanding the liberty which every one may juſtly challenge of framing an air agreeable to his own fancy; yet it cannot be ſaid, that this liberty is uncontroulable, or beyond the power of art to preſcribe bounds to: For then indeed every ſtrain compoſed by even a bad and injudicious ear might ſtand in competition with the moſt finiſhed pieces. But as this will not be allowed on any hand, even an undiſtinguiſhing ear conceiving a degree of pleaſure in hearing good muſick; ſo there is no doubt but that there muſt be ſome precept or manner found out by experience, to aſcertain and conduct the air or ſtrain, and which will render it to a good and judicious ear plainly preferable.

The rules therefore which we ſhall lay down for melody, are ſuch only as are founded in truth and reaſon; the reſult of experience, joined to ſkill; and which are admitted in every liberal art: Theſe are unity, imitation, and order. If it ſhall be ſaid, that perſons unſkilled in muſick, but otherwiſe very capable from a natural good ear, will ſing an air which an artiſt cannot find fault with, we confeſs it may be in ſome ſort true.

But the ſtrains of ſuch compoſers are always very ſhort; and as they ſeldom or never depart from the key, ſo they afford not that variety ſo deſirable in muſick: Nay, what is this but ſaying that the rules of art are concluſions taken from nature, as in truth they are; ſo then they muſt be aſſuredly right? This muſt be ſo, when the appeal is made from art to nature.

As to thoſe eſſays called voluntaries, there was never a good one performed but by a good maſter. The muſick was always good in proportion to the maſter's ſkill in the art; in proportion to the variety he introduced according to the rules of art. Therefore even voluntaries are the effects of knowledge and deliberation.

But to return. The firſt rule of melody is unity.

The unity of tune is ſaid to be in reſpect of the key, and of the ſubject.

Every tune muſt be written in ſome key, in which it muſt begin and end.

As every air is ſaid to be in ſuch a key as is the laſt note, eſpecially the laſt note of the baſs; ſo there is the ſame neceſſity for the firſt and laſt note of every air to be ſome member of the concord of the key. This diſcovers the deſign of the author. Having thus fixed the attention of the hearer to this particular, the ear and imagination can no other way be ſatisfied than by holding to and executing the ſame deſign.

The unity of tune is as neceſſary in this reſpect, as conſiſtency in the words and ſentiments of an orator is requiſite to diſcover the ſcope and meaning of his diſcourſe.

Secondly, the unity of tune, in reſpect of the ſubject, ſignifies, that there ſhould be one ſubject of every piece of muſick repeated and inſiſted on, as often as conveniently can be, throughout the whole piece.

And this repetition will be in proportion to the length of the tune, and deſign of the compoſer. Even in a minuet, or any other exact piece confined to a certain number of bars, the repetition of the ſubject may be effected. Now, the ſubject of every air, or piece of muſick, is the firſt paſſage of the ſame, for any number of

bars,

bars, be they more or lefs, as it fhall happen; every tune being ftamped with fome prevailing idea or fancy peculiar to itfelf, and therefore diftinguifhing it from every other.

The fubjects of grand pieces of inftrumental mufick are contrived with care and ftudy; and invented with defign to enlarge or defcant upon at will; not being confined to any length, or certain number of bars. Such pieces, being the efforts of great and mafterly genius, afford all the pleafure that defign and invention, carri d on by every mafterly ftroke of art, can give.

The fecond rule of melody is imitation. As in the executing other arts, a fimilitude and proportion of the members ought to be preferved; fo imitation, or a repetition of the moft ftriking paffages, anfwers to this in mufick.

Imitation may be performed many ways. Firft, when the repetition of the paffage is made, beginning on the note above the leading note of the paffage; or on the third, fifth, eighth, or any other interval.

A paffage alfo may be imitated in any of the defcending notes. A repetition on the octave below is frequent in every good author.

In the repetition of paffages, there are two varieties.

The firft is, when the paffage is repeated in notes belonging to the harmony of the key. It will feldom happen in this cafe, that the paffage will in the repetition be precifely the fame, in refpect of the intervals of the notes, though the movement be an exact imitation.

The reafon of this will be evident, if we confider that the intervals in both flat and fharp keys refpectively afcend by different degrees; the femitone changing the intervals almoft continually.

See example, No. 12. in the theory.

In thefe examples no more than two flat or fharp thirds fucceed each other. And where they do fucceed, the femitone is in a different place in the two like intervals of flat thirds; it being the third of one interval, and 2d of the next afcending 3d, or the contrary.

In the fharp key, two fharp 3ds afcend from the 4th and 5th, and in the flat key from the 6th and 7th. The inequality of the flat 3ds, and of the few inftances of their fucceffion, is owing to the places of the femitone.

To the inequality of the 3ds is owing the inequality of the 4ths, 5ths, and every other unequal interval in the courfe of the notes; the greater neceffarily partaking of the inequality of the leffer, which is included in it. All this is evident.

Therefore, the repetition of a paffage will not be precifely as the paffage, except in the places abovementioned; that is to fay, a repetition of fharp thirds from the 4th and 5th of the fharp key; and of the fame, on the 6th and 7th of the flat key. And in the fharp key, there may be an imitation in the compafs of fix notes afcending; namely, from the key and its 5th. We have been particular in remarking the want of exactnefs in imitation on notes belonging to the key. Not that we mean to mark it as a defect; for it is beyond doubt, that every paffage in the harmony of the key muft be pleafing whether it be a perfect imitation or not.

Befides, this diffimilitude, arifing from the place of the femitone being changed, is fo far from being chargeable with a defect, that, as hath been often faid, it produces that fweet variety which is founded in the principles, and which every artift purfuing will fucceed in; as in this he doth no other than copy after nature.

Thefe remarks on the imitation of a paffage in the notes of the harmony of the key, will lead us to the fecond manner of imitation; which is fuch, as that every note in the repetition ftands exactly in the fame interval refpectively as the notes of the firft paffage.

This then is a perfect imitation. Which, as it cannot take place in the harmony of the key, except in the few cafes abovementioned, it muft be effected by art; that is, by altering the places of the femitones in the key, fo as to correfpond with thofe in the original paffage, by marking a fharp for the femitone afcending, if the repetition be in notes above the paffage; and a flat for the femitone removed lower, if the repetition be in the defcending notes.

In this manner there can be a perfect imitation of any paffage of any length whatfoever, and of any compafs: in every inftance of which, the key is changed, by introducing notes not belonging to the harmony of the fame.

As every interval of the firft paffage muft be preferved in the repetition: it will fometimes happen, that many flats, or fharps, muft be added to the notes in the repetition. The rule of this practice will be well underftood, when we fhall have learned the art of tranfpofition; the repetition of any paffage in this manner being no other than a tranfpofition of the fame into another key. In regard to this perfect imitation, we have one remark: which is, that if a repetition be made on the note next above, and repeated again the note ftill higher, it will have a good effect; for this will create fuch a novelty in the ftrain as is furprifing; befides that it affords the author an opportunity both of making new defcant or enlarging on the fubject in this new key, as well as of fhewing the greateft fkill by returning from that digreffion into the original key with art and propriety.

This will be no difficult matter to one who underftands well the art of tranfpofition. Now, the repetition of the fubject tranfpofed into a key different from the original belongs to this fecond rule of melody; as the repeating the fubject in its own key refpects the rule of unity.

The repetition of the fubject after thefe two manners, and throughout the feveral parts, as treble, bafs, tenor, and fo on fucceffively and conftantly, each part taking it up immediately, or as foon as the repetition is finifhed in another, whereby the feveral parts feem to move in purfuit of each other, is called a fugue.

Mufick compofed on this defign is juftly efteemed above all other, not only on account of its excellent contrivance, but for the fake of the pleafure alfo which it affords.

In a juft fugue is reprefented all the variety poffible; at the fame time that an uniform progreffion of the parts is preferved throughout the whole, without the leaft difcovery of the figns of art.

The reafon for this may be, that the repetition of fo interefting a paffage as the fubject is, is fo natural to the imagination

imagination and ear, as not to be easily distinguished as the effect of art. The construction of a fugue will be understood, from this description, to be in the following manner.

The subject being first written in that part which the composer intends to be the leading part, the same must be set down again in the next part wherein the repetition is appointed to be made, either in unison, or on the 4th or 5th to the key or subject, the 2d, or any other interval; in which matter the composer is at liberty.

Yet the repetition on the 4th seems more natural to the flat key; as, on the 5th, it is to the sharp key.

If the musick be in two parts only, the subject being written in each part in succession; the next step will be to frame descant to that part where the repetition is, and which therefore will be written in the leading part. Henceforward the parts move on at liberty, that is, no where repeating the subject, but expressing all the variety in descant each to the other, which the fancy, invention, and skill of the author suggest, until the subject is again repeated, either in the key, or some interval of the harmony of the key, or perhaps in a new key.

The imitation of this must immediately follow in the other part, in unison, or otherwise.

If the musick be of three or four parts, let the subject be first written in every part, in succession; and in the order you intend. Then fill up with descant the second bar, or more, of the leading part; that is, as far as the subject reaches in the other part; and proceed likewise on the next repeating part with other new descant; and so on through every part, until all the staves are equally full.

After which the parts move at liberty, as before in a two-part fugue, until another repetition of the subject.

But where, or how frequent, the repetition of the subject may be made; or on what interval, whether above or below; or by what succession of the parts, (for they need not preserve the order they began in;) is neither the business, nor in the compass of the rules of art to prescribe.

In these matters, the composer is as much at liberty as his genius and invention can furnish matter and variety. So that in some places the subject may be repeated continually, in the different parts, on intervals and in a key different from the original key or order.

Sometimes, the movement of the subject being the same, the notes are changed from ascending to descending, or the contrary. Sometimes even the movement to the contrary. At other times, a new subject is introduced; and then it is called a double fugue. And lastly, for the sake of variety, the subject is repeated backwards, or inverted; so that the parts seem to pass each other by contrary motion, instead of pursuing.

In a word, there is no passage which expresses variety, which may not be introduced in a just fugue; while the uniformity is preserved in the imitation of the same, and resuming the original subject, and key, towards the conclusion or close of the piece.

We shall only add, that if the descant which fills up the bars be constantly written in all the parts successively and in order throughout the whole piece, the fugue is, from the exactness of this repetition, called a canon. In framing of which, observe, that if the canon consist of three or more parts; when the third part takes up the subject, the descant in the leading part must be part of the harmony of the other two.

What remains to be spoken to on this second rule of melody, or imitation, is the method of returning into the original key, after a passage in a remote one. This will lead us to consider the half-tones not belonging to the harmony of the key, or chromatic notes.

For if a passage, or repetition of a passage, be in a new key, which is the imitation we are now speaking of, the resuming the key immediately will be by chromatic notes; descending if the repetition were above; and if the repetition was in notes below the passage, we may ascend into the key by chromatics likewise, or half-tones ascending.

This is evident. For every key, flat or sharp, having its semitones in their proper places, a passage is not in the key, when the semitones are out of their places.

Therefore the returning into the key, from a passage not in the harmony of the same, must be by removing the new half-tones.

This depends on the knowledge of transposition.

The new semitones introduced in a passage, or imitation of one, we have called chromatic notes; because every semitone not belonging to the harmony of the key are to be found only in the chromatic scale.

Yet this is but improperly. For two, three, or more semitones succeeding each other are properly called chromatic notes; which, to musick wherein the frequent use of these is made, gives the name of chromatic musick.

The use of chromatic notes is to raise the attention by the uncommon and unexpected variety they produce.

For every new half-tone ascending, being understood by the ear as the greater 7th, implies a new key. Three or more semitones ascending after each other, do therefore raise the expectation of so many new keys: whereby the curiosity is greatly excited; and the expectation of the ear being gratified, in the imitation of a close, by every new semitone, the musick becomes, as in all other cases where novelty takes place, truly the object of admiration. In a series of semitones ascending, the last is in the place of the key. When chromatic notes descend, the last but one is the key, for the same reason; namely, the semitone below sounding as the greater 7th, every key being a semitone to its greater 7th or half-tone below relatively.

Chromatic notes ascending, by alarming the ear and imagination, elevate the soul, thereby imitating the sublime.

Chromatic notes descending, express the pathetic, which is free from any alarm or terror. The performance of these notes should always be with softness, which naturally removes the apprehension of terror. Ascending and descending semitones partake of the nature of the sharp and flat keys; as hath been said concerning the power of musical sounds to touch the passions

Chromatic notes may be introduced in many places.

If, in a passage, the semitones of the key occur among others, they are to be accounted as chromatic. Therefore

fore flat and sharp keys are equally capable of improvement by them.

Notwithstanding chromatic notes create so much variety and elegance, it must not be understood that they are to be introduced injudiciously, or without any address; for then they would not only be useless, but injure the musick. Chromatic notes being so affecting and expressive, as we have shewn, their place in vocal musick will easily be determined by the sentiment.

As, on the other hand, to introduce lively or pathetic sounds, where the sense is dissonant from either, is introducing contradiction and confusion.

Neither is it natural in instrumental musick to break in upon a lively strain by slowly-moving chromatic notes. Though at the end of a brisk movement, the transition is good. For music which moves in semitones, though quick notes, must appear slow to the ear, which expects the greater intervals of the diatonic scale, or whole tones.

Yet instrumental musick does properly admit the mixture of chromatic notes, when they are accommodated to the genius of the strain or subject. Neither will it be difficult to judge of this propriety. For musical sounds having a natural tendency to express our ideas, the place of chromatics will readily be found by this mark; it being in the power of the composer to imagine ideas without the help or intervention of words, and so substitute these ideas in the place of words, and make them the subject of his strain. Thus he may fill his mind with the imaginary passions of love, sorrow, anger, dejection, pity, and the like; the expressions of which will be most easily distinguished by musical sounds, and varied as the subject requires. Thus, if two or more of the passions, especially contrary ones, be represented by turns, it will form in the imagination a kind of conversation between persons, which never fails to strike the attention stronger, and make a deep impression on the hearer.

Besides this, the imagination of the composer will be assisted in the invention of variety; and the different passages of the piece will be furnished with notes proper and natural to each; for the same reason that choice and expressive words flow in upon a good writer who is master of his subject. We shall only add, that if sometimes the different passages be allotted to the bass and treble by turns, it will greatly diversify the subject, mark the sentiment stronger, and thereby cause new pleasure. So much for chromatic notes. Notwithstanding, what hath been said in this place doth not respect chromatics only; but in general the whole process of an elaborate piece, in every form and transition of the melody; wherein only there is opportunity for application of what we have here suggested.

The reason why we have given place to chromatics under this second rule of melody, or imitation, we have already assigned; namely, that the use of half-tones is necessary where there is a repetition of a passage in another key. For, whatever proportion of sounds is found in the natural order, the same may be transferred by art, and improved upon every occasion, as thereby imitating nature. And this, by the way, is likewise the true reason for the resolution of discords by semitones; being taken from the original pattern, or resolution by the two semitones in the natural series of sounds in the octave.

The third rule of melody is order.

Order in musick is the conducting the melody or air, according to a certain rule, through several intermediate closes, from the beginning to the final close or end of the tune.

A close is the termination of a passage in a concord; which, like a period in sense, is framed with design, and from the preparation from the notes immediately preceding, which are the whole tone above, the half tone below, and the 5th (generally the bass note) is expected by the ear. This is the description of a full close, which is ever the final close, especially of quick movements. This preparation is the concord of the 5th to the note on which the close is made; the bass making the great cadence, as we have taught in the rules of composition.

This preparation is in full harmony. But it must be remembered, that there is a preparation also from discord; chiefly the discord of the flat 7th, of which we have said enough in the chapter of discord or figurate descant. In slow movements there is a preparation to a full close; which shall be described presently.

Every intermediate close hath its preparation in imitation of the final close, more or less. For there is no necessity for the parts taking invariably the same member of the chord; so that the treble oft times makes the cadence from the 5th, particularly in quick passages; in which likewise, in the middle of a strain, many imperfect closes may occur, the parts taking the notes indiscriminately as they happen, without any preparation designed. It is enough to mention these.

But in order to conduct the air in each strain, if there be more strains than one, with propriety and method, there must be a full close in several places in the harmony of the key. These are called proper closes.

These are also closes made by the introduction of a new semitone, by the addition of a sharp, making the greater 7th not belonging to the harmony of the key. These are rightly called improper closes.

The places and order of both these we shall now assign.

The first proper close falls naturally on the key. This is not meant of the final close; for a close may be made on the key, within a few bars of the beginning: yet this close is seldom made, as not affording variety. Again, the first strain sometimes closes on the key: yet the close of that strain is more properly on the 5th; and the close next after that on the 5th falls naturally on the key.

When a close is made on the 5th, the 4th of the key being removed a semitone higher, becomes the greater 7th by the addition of a sharp. For, in imitation of the final close on the key, there must be a semitone ascending.

Notwithstanding, a close made on the 5th, with a sharp 3d always, from the chord of the 4th in a flat key, without altering the 4th, or bringing in the greater 7th, is accounted an elegance: in which passage the bass takes the flat 6th or 3d to the 4th, and thence descends by the semitone into the 5th.

This is never practised but in very slow movements.

From

From the neceſſity of a ſemitone aſcending to every full cloſe, except this laſt inſtance, we draw this inference, That a cloſe may be made on every ſemitone in the key. This aſcertains the places in both flat and ſharp keys: in the cloſes of both which the key is a ſemitone; in a ſharp key, the 4th alſo; and in the flat key, the 3d and 6th.

Theſe are the places of proper cloſes, or ſuch as are made in the harmony of the key.

The order of cloſes is now to be conſidered, which, in a ſharp key, may be thus. The key, the 5th; the key, the 4th; the 5th, the key.

Notwithſtanding, every compoſer, being at liberty to purſue his own deſign, will prefer that order which will ſuit beſt with the manner of the air, or anſwer his intention. Our buſineſs is only to point out the places where cloſes may be made, and give a general idea of the order. For we have obſerved much difference in practice among the beſt authors; and indeed it cannot be otherwiſe in long and finiſhed pieces, conſidering that liberty inſeparable from every compoſer who invents; and therefore every manner which may increaſe variety, is to be recommended,

The order of cloſes, then, in the flat key may be, The key, the 3d the 5th, the key.

Or, the key, the 5th the 3d the 5th, the key.

Or again, the 5th the key, the 3d the 5th, the 3d the 6th, the 5th the key.

In pieces of a conſiderable length, cloſes may be repeated in theſe ſeveral places, and the ſucceſſion of them altered from that wherein we have ſet them down above.

Improper cloſes, or ſuch as are made on any other note than the key, flat 3d, 4th, in a ſharp key, 5th or 6th in a flat key, are made by bringing in a ſemitone not in the harmony of the key, by the addition of a flat or ſharp, the note below the new-made ſemitone being always the greater 7th, and which thereby determines the note on which the cloſe is to be made.

By this art a cloſe may be made on any note; as on the 2d, 3d, 6th, or 7th of a ſharp key; on the 2d, 4th, and flat 7th of a flat key. A cloſe on the 6th of a ſharp key is much in uſe, though no ſemitone: this depends on the 6th having for harmony its own chord, which will be proved in the next chapter.

It remains to be remarked, that as every new key is formed by the addition of a ſharp or flat; ſo the return into the former key, whether the original, or otherwiſe, is effected by taking off the flat or ſharp from that note, the next time it occurs in the courſe of the ſtrain.

In muſick of two parts, the greater 7th, or that which makes the new ſemitone, will not in every paſſage be expreſſed; the treble ſometimes deſcending from the 3d above into the cloſe. Yet, if the baſs falls the 5th, theſe two members of the chord do properly lead to the cloſe.

However, it muſt not be underſtood that in every cloſe the baſs muſt move the ſame way, by deſcending from the 5th, as was ſaid before; no part having any member of a chord proper to it by any neceſſary or natural dependance; for otherwiſe the ſecond treble, or tenor, could never aſcend above the firſt, nor the baſs above either; than which nothing is more common. Cuſtom indeed has appointed to the baſs this movement at a cloſe, for the moſt part, and eſpecially at a full or final cloſe: and juſtly; the deſcending from the 5th, being ſo intereſting a movement, is better expreſſed, as well as more ſuitable to the grave notes of an inſtrument performing the baſs.

There is another paſſage in practice, which, though not a cloſe, yet comes properly in this place to be ſpoken of. It is a ſudden or unexpected ſtop of all the parts made on a diſcord.

As this is generally practiſed in quick movements; ſo it is often, though not always, ſucceeded by a ſlow movement: during this ſtop, the ear is held in ſuſpenſe by the diſcord, and waits for the reſolution into the concord.

The ſuddenneſs and novelty of this paſſage recommend it. It ſeems contrary to a cloſe: for as, being a diſcord, it hath no preparation, and, not being reſolved as ſoon as the ear expects, ſeems to loſe its connection with the following chord; its meaning therefore is undetermined, and the ſenſe confuſed: yet it hath a good effect by alarming the imagination, reſembling an affected perturbation in the order of the words and ſentences of an oration.

Chap. V. Of TRANSPOSITION.

Transposition is the removing a tune from one key into another. The uſe of tranſpoſing is to bring a tune within the compaſs of ſome inſtrument, or for the more eaſy performance on an inſtrument; ſome keys being more difficult to perform in than others; eſpecially in wind inſtruments, as the German flute, *&c.* For as to inſtruments that are ſtopped, as the violin and baſs-viol; and inſtruments with keys, as the organ and harpſichord; all keys are eaſy to a good performer, who is ſaid to be maſter of the ſcale of the inſtrument.

Secondly, Tranſpoſition is abſolutely neceſſary in muſick for voices and inſtruments, when it happens that the key in which the muſick is written is too high or too low for one or more of the voices. In this caſe, the muſick muſt be tranſpoſed for the inſtruments into the key which is neareſt to and will beſt ſuit the pitch and compaſs of the voice. For as to the vocal performer, it matters not in what key the muſick be written for his part, provided he can ſing in the cliff, (or indeed, if he can tranſpoſe, as ſhall be taught in the laſt chapter, Of ſinging by note, whether he can ſing in the cliff before him, or not,) if the inſtrument be accommodated to his voice.

There are two ways of tranſpoſing. The firſt is, when the tune is written in another key, at any diſtance above or below the original, with the proper flats or ſharps prefixed. When this is done, the performance on the inſtrument is eaſy; the half-tones of the key, and every other, keeping their due places expreſſed in the writing. This may be called tranſpoſition by writing.

The other method of tranſpoſing is by the cliff; that is to ſay, when the cliff is removed, or ſuppoſed to be removed, from the place wherein it ſtands prefixed to the tune.

This removal of the cliff at once tranſpoſes the whole, without alteration of the writing; the uſe of the cliff being, as hath been ſaid, to aſcertain the names of the notes. We ſhall ſhew both theſe methods of tranſpoſition; and firſt of tranſpoſition by writing.

Tranſpoſition

Tranſpoſition, in general, is writing or playing a tune in a different key from that wherein it is written, preſerving the places of all the ſemitones.

If the notes in the ſcale of muſick expreſſed no other than whole tones, tranſpoſition would be evident to ſight. For a ſeries of tones at equal intervals would, when removed to any diſtance or interval, preſerve their places of themſelves (ſo to ſpeak,) or without the help of art. And the performance of the ſame on an inſtrument would be equally eaſy in all keys; no alteration happening thereby, but changing the names of the notes. And even this would be unneceſſary.

The ſemitones therefore are the cauſes of any obliquity in the ſcale of tranſpoſition; and therefore the keeping them in their due places is the art we are now ſpeaking of. As it is ſaid in the theory, they are the foundation of writing the ſame tune in divers keys, which is tranſpoſition.

We muſt have recourſe therefore to what hath been ſaid in the theory concerning the eſſential difference of tune, or the different places of the ſemitone.

When the firſt ſemitone above the key is on the 4th, or 6 ſemitones to the key; the 3d, which is 5 ſemitones, is the greater, or ſharp 3d; and the tune is from hence ſaid to be in a ſharp key.

Again, when the firſt ſemitone above the key is on the 3d, or is 4 ſemitones to the key, that being the leſſer or flat 3d, the tune is in a flat key. Again, the next ſemitone in the ſharp key is the 8th; and in the flat key on the 6th.

In every ſharp key, the ſemitone muſt ſtand in the ſame places, that is, the 4th and 8th; and in the flat key, in the 3d and 6th.

The name of the ſharp key in the ſcale, whoſe ſemitones are in their places without the addition of flat or ſharp, is C. Hence C is called the naturally ſharp key. Its ſemitones are F and C.

This is the pattern for tranſpoſing in all ſharp keys: chiefly by remembering the letters or names of the ſemitodes.

The key in the ſcale, whoſe ſemitones are in their places without the addition of flat or ſharp, is A. Hence this is called the naturally flat key. Its ſemitones are C and F. This is the pattern for tranſpoſing in all flat keys; remembering the names of the ſemitones.

It may be required to tranſpoſe from any key with a ſharp 3d, into any other of the ſame; or likewiſe from any flat key reſpectively. Notwithſtanding, we ſhall proceed, according to our method, to ſhew what are the keys in the natural ſucceſſion into which a tune will be tranſpoſed, beginning at C the naturally ſharp key. As the properties of every key will be diſcovered by this method; ſo it will anſwer every thing that can be required in tranſpoſition; or ſhew how a tune may immediately be tranſpoſed from any key into any other interval or key that may be required.

For inſtance, let it be required to tranſpoſe from the key of C into that which is next in the natural order of tranſpoſition. F is the firſt ſemitone in the key of C; which, by the addition of a ſharp, becomes F ſharp, and conſequently the greater 7th to the ſemitone above it, which is G. Therefore G is the new key into which the tune is tranſpoſed. No. 99. For,

Again, let it be required to find the next key to be tranſpoſed into, from the former, or G.

The firſt ſemitone in the key of G is C: which by the addition of a ſharp, which is removing the ſemitone, becomes C ſharp, or the greater 7th: therefore the new key is D No. 100. For,

Obſerve that every former ſharp which is ſet down for the tune tranſpoſed, is included in every ſucceeding tranſpoſition. That is to ſay, C, for inſtance, cannot be marked ſharp, unleſs alſo F be marked.

The reaſon of proportion demonſtrates this to ſight. Theſe are the two ſemitones of the open keys, as they are termed; the obſervation will hold true of all others, as will be ſeen in the following inſtances.

To tranſpoſe out of D into the next key; the firſt ſemitone in the key of D is G. But G ſharp is the greater 7th to A. Therefore A is the new key. No. 101.

Take notice, that the firſt ſemitone, or 4th in the ſharp key, being removed by the addition of a ſharp; the tune is hereby tranſpoſed into the 5th to the key.

This removal into the 5th, by changing the firſt ſemitone, being the ſame in all ſharp keys, it need not be repeated in more examples. For the next to A will conſequently be E, with the addition of A ſharp to D.

The next B with A ſharp.

The next will be F ſharp with E ſharp; never uſed.

The next would be C ſharp with B ſharp; never uſed.

The next would be G ſharp with F having two ſharps; never uſed.

The next is D ſharp, with C having two ſharps; which laſt is D natural. This key is in frequent uſe: but the name of the key is changed, and marked with its equivalent E flat: and the name of its greater 7th is likewiſe changed; and, inſtead of C having two ſharps, is left, as in truth it is, D natural.

The next is B flat; its greater 7th A natural.

The next is F natural; its greater 7th E natural. From this we aſcend, according to the rule, by a 5th into C where we began.

Hence it is evident, that of the twelve ſemitones in the octave, nine are in uſe as keys with a ſharp 3d.

Of which the following are examples in their order. No. 102.

The laſt three examples marked with flats may be demonſtrated in another manner; which is, by changing the place of the other ſemitone, or 8th, by removing the ſharp 7th, by prefixing to it a flat. The tranſpoſition will, by this alteration, happen in an inverted order from that in the foregoing examples. For, as the 4th or firſt ſemitone in the former manner, being removed by the addition of a ſharp, became the greater 7th; ſo in this caſe, the greater 7th being removed by prefixing a flat to it, becomes the 4th of the next key. No. 103.

This manner of demonſtrating the laſt three keys is preferable. For, by changing the firſt ſemitone, as in the former manner, it doth not ſo plainly appear, as that depends upon the foregoing key, which never was in uſe. Beſides, the number of ſharps to be prefixed to theſe keys might perplex a beginner in tranſpoſing; whereas the flats,

flats, as prefixed in the example, do more methodically follow the removing the greater 7th by a flat.

The demonstration is equally certain and clear in both manners. Let it be remembered, that in transposing, by altering the greater 7th, the key is removed to the 4th above.

Let us proceed to transposition in a flat key: the general rule of which is the same as for the sharp, to remove the semitones, and thereby preserve the proportion of the key.

The different places of the semitone will cause some variation in the effect, or interval of transposition.

Let it be required, according to our method, to transpose out of the open or naturally flat key A, into that which is next by natural succession.

The first semitone in the key of A is the 3d, or C; which, by the addition of a sharp, becomes the greater 7th: wherefore, the new key, or that into which the tune will be transposed, is D. No. 104. For,

Let it be remarked, that the greater 7th which determines the new key in this as well as in the sharp key, is never prefixed to the tune; which to the sharp key always is.

The reason is, that the flat 7th is the property of the flat key. To prefix therefore a sharp to the place of this note on the stave, or beginning of the tune, would be a constant contradiction to all the flat 7ths that may occur throughout the whole air. But the sharp 7th, when brought in at a close, middle or final, or elsewhere where there is no close, is marked particularly as occasion requires.

Another reason for not prefixing a sharp on the stave to the place of the 7th of a flat key is, that, in some keys, the 6th must have its flat set on the stave, or beginning of the writing: a sharp, then, on the place of the 7th would appear a contradiction to sight, and ought therefore to be avoided.

The removal by transposition in the flat key being always to the 4th above, as in the last example, there needs no other example at length of transposition in this key, the same proportion obtaining throughout every key with a flat 3d respectively.

According, then, to this proportion, the next key after D will be G; the 3d of the former, or F natural, becoming F sharp the greater 7th, E flat its 6th.

The next will be C. Its greater 7th is B natural, with the addition of a flat to A its 6th.

The next will be F, with the addition of a flat to D its 6th.

The next would be B flat, with the addition of a flat to G its 6th, never used.

The next would be E flat, with the addition of C flat its 6th, never used.

The next would be A flat, with the addition of a flat to F its 6th, never used.

The next would be D flat, with the addition of two flats to B, never used.

The next would be F sharp, its 6th D, never used.

The next is B, its greater 7th A sharp.

The next is E, from whence we ascend by a 4th into the first key A.

Hence it is plain there are seven flat keys in use, out of the twelve semitones in the octave. Of which the following are examples, with their proper signs prefixed. No 104.

It may be observed, that by changing the place of the other semitone or 6th, by adding a sharp, the transposition is by two degrees of the former at once; as from A into G, and so on. But this is no more that what hath been done in the second step of this example; yet by putting this sharp to the 6th, it is a short way of transposing into the whole tone below.

It appears from hence, that there are in all sixteen keys in use; a fund for great variety: among which you will observe, that some sharp keys have flats prefixed, and some flat keys have sharps; which cannot by this time appear strange to one who perceives the necessity of preserving the proportion of each, and who must now understand the truth of the 3d axiom of the practice, That no tune composed in a sharp key can be transposed into a flat one, nor a flat one into a sharp; for that would be altering the permanent nature of things.

From comparison of the examples, will be seen what is most worthy of remarking; which is, That whatever sharps or flats belong to any flat key, the same are likewise the property of that sharp key, which is on the same flat key's 3d: for instance, A with a flat 3d, and C with a sharp 3d; so D and F, G and B; and so of all others respectively having the same signs belonging to and prefixed to each.

Hence we collect, that the essential difference of tune consists in the form, that is, the position of the semitone, and not in the materials of musick.

A truth which appeared before in the comparison of discord with harmony; and which will be of great service hereafter, in the art of learning to sing by note.

This inference furnishes us with a proof of the 4th of a flat key, and 6th of a sharp key, having for harmony each his own concord.

A proof which was wanting; as it could not be had from the rules of harmony, neither of these intervals being in the place of a semitone. The general theorem is this: As by axiom 2d the proportion of one single sound is to another according to the natural order of sounds; so the proportion of one chord to another will be according to the natural succession of chords. For a chord is no other than an unity of sounds. But it appears that the succession of chords by transposition in the flat key, is by 4ths, that is, the chord of a note, with a flat 3d; and that of the note's 4th is the same. Now, the harmony of the key or given note is the concord of itself: therefore the harmony of the 4th in a flat key is the concord of itself.

In like manner we demonstrate the harmony of the 6th of a sharp key to be the chord of the same.

And in this the proof lies nearer the truth than in the former case.

For the chord or proportion here is not only the same, but the individual sounds.

For as by comparison, as above, of any flat key with the key of its 3d (which must ever be a sharp key, the flat and sharp 3ds being the compound intervals of the 5th) the

the properties and proportions are not only like, but the ſame, the difference conſiſting in the form or place of the ſemitone; ſo the chord of one key will be to the chord of the other, not only like, but the ſame. Now the harmony of every flat key is, by the the rules of harmony, the concord of itſelf: but the concord of the flat key is the relative ſharp key's 6th; therefore the harmony or chord of the ſharp key's 6th is the concord of itſelf.

Let us now apply theſe rules of tranſpoſition to the ſecond rule of melody, or perfect imitation, which is the repetition of a paſſage in notes not belonging to the harmony of the key; by which notes we underſtand all that have a ſharp or flat added, which was not prefixed to the beginning of the ſtave or tune.

The general rule of which is, Firſt name the key in which the paſſage is written, whether the ſame be the original key, or that of the tune, or ſome other; then name the interval of the firſt note of the paſſage to the ſame key.

Whatever interval the imitation begins on, whether a 2d, 3d, 4th, 5th, or any other above or below the paſſage, it bears the ſame proportion to the key of the imitation as the firſt note of the paſſage to its key. Thus

G is to C as A is to D, or
G : C :: B : E, or again
D : A :: B : F, or
D : B :: E : C.

The leading note and key being thus expreſſed, both of the paſſage and imitation, ſhews the proportion of the imitation above or below paſſage.

If the paſſage be in a ſharp 3d, as the imitation muſt be ſo too, the ſigns, as prefixed to one of the examples of the ſharp keys, will be required to be added to the notes of the imitation; and if the paſſage move with a flat 3d, the examples of the flat key diſcover the marks wanting in the repetition.

Thus G, the leading note of a paſſage in C, with a ſharp 3d, repeated in the note above; as A and D require two ſharps, namely on F and C, the property of D with a ſharp 3d.

And the ſame paſſage in C with a flat 3d, will in the note above require B marked flat, the property of D with a flat 3d:

And G C ſharp 3d, tranſpoſed into a 3d, or B E, requires four ſharps, on F, C, G, and D, the properties of E with a ſharp 3d.

The ſame paſſage with a flat 3d, or any other paſſage, will, when tranſpoſed into E, require but one ſharp on F:

And D B, with a ſharp 3d repeated in E C the natural ſharp key, require neither ſharp nor flat.

But the ſame, or any other paſſage with a flat 3d, will, when tranſpoſed into C, have three flats on B, E, and A, the property of C with a flat 3d: and if there be no leading note, as it may often happen, nothing more is to be conſidered than the key.

Thus the uſe of tranſpoſition in perfect imitation is evident.

The ſecond method of tranſpoſition is by the cliff.

The uſe of the cliff is to aſcertain the names of the notes. Therefore, the names of the notes will be changed by removal of the cliff.

Now as, in tranſpoſing, it is neceſſary that every interval be preſerved, or that the ſemitones keep their due places; ſo by altering the name of the firſt note of the tune, by removing the cliff, all the other notes are altered in proportion.

Thus the removal of the cliff effects at once what was done in the other method by the tranſpoſition of every ſingle note of the tune by writing.

This way is eaſier to the writer, but much more difficult to the performer.

Inaſmuch as a confirmed habit in any thing is harder to be changed for a new method, than it is to learn by a certain rule at firſt.

Therefore the performance in tranſpoſition by the cliff can no otherwiſe be attained, than by conſtant and repeated practice in all the cliffs, and in all ſuch places as they are uſed to be ſet for convenience.

Every one therefore who deſires to become a maſter in performance, after he is well acquainted with the three cliffs in their uſual places, ought to accuſtom himſelf to perform in every cliff, in whatever place it may be ſet. This knowledge will not only render the performance convenient to his private amuſement, by the variety with which he can furniſh himſelf, by playing the ſame air in whatever key he pleaſes; but will alſo make him an uſeful member in a concert, by tranſpoſing at ſight, whenever it may be required to accommodate the inſtrument to the voice. For let it be underſtood, that to him who is ſo well acquainted with the places of the cliffs, as to perform in any of them at ſight, nothing more is wanting to his tranſpoſing by the cliff at ſight than to imagine the cliff is prefixed to ſuch or ſuch a place, and commit to his memory the name of the key n which he is to perform, by tranſpoſing according to the removal of the cliff which may be moſt convenient.

This will fix the places of the ſemitones, or aſſign the ſharps or flats belonging to the new key, as they are ſet in the example in the firſt method of tranſpoſing by the writing.

Any of the cliffs may be removed; yet the C cliff or tenor is moſt commonly in uſe for this purpoſe.

The general rule for tranſpoſition by the cliff is this.

To tranſpoſe into any interval above the key, remove the cliff by the ſame interval deſcending. And if the inſtrument be too high for the voice, to tranſpoſe into a lower key, remove the cliff to a convenient interval higher.

For, raiſing the cliff depreſſes the notes; and, contrary, ſetting the cliff lower raiſes the notes, or tranſpoſes them into a higher key, in proportion.

Chap. VI. Of SINGING by NOTE.

The art of ſigning by note is founded on the principles and practice of muſick. Therefore we have reſerved this ſubject to the laſt.

To ſing by note ſeems in ſome reſpects more difficult to attain than performance on ſome inſtruments. In other reſpects, it is eaſier and ſooner acquired.

The

The more time is laid out on the practice on ſome inſtruments, the more difficult the execution grows, in ſome ſenſe, that is, according to the conſtruction and compaſs of the inſtrument. On the contrary, all the difficulties in learning to ſing by note preſent themſelves in the beginning, in appearance greater than they really are; and which a knowledge of the principles of muſick, and a little of the practice, with a tolerable good ear, will with eaſe overcome.

Beſides, a little time and experience will convince any one of what compaſs his voice is, and what degree of performance he is capable of attaining. The principles of ſinging therefore being well underſtood, there remains no further difficulty; no one having a right to expect he can execute more than what is within his natural powers.

If this art is not ſo commonly underſtood, or the knowledge of it ſought, it may be owing to this, that the precepts for learning, or the manner invented, and conſtantly uſed, are more perplexed than the ſubject demands.

How far this may be true, will appear from an obſervation or two which we ſhall make on the method now in uſe.

The art of ſinging by note reſts on theſe two principles; the finding the places of the ſemitones, and tuning them and the whole tones of the octave aright.

The firſt of theſe has been delivered in the theory; and alſo in the practice, under the laſt article Tranſpoſition. The tuning the notes is the ſubject we are now engaged in.

Let us firſt examine how far theſe have been proſecuted in the preſent method.

The notes of the octave, beſides their names in the ſcale, have been uſed to be diſtinguiſhed by theſe four ſyllable, Sol, la, mi, fa; acommodated to the purpoſe of ſinging by note, in the following order.

Fa ſol, la, mi, fa, ſol, la.

Whereof Sol being thrice repeated in the octave, La twice, Fa twice, and Mi once; four ſyllables expreſs the 8 notes.

The art of tuning by theſe, or aſſigning the places of the ſemitones, is by appointing to Mi the place of the greater 7th; and then Fa immediately following expreſſes the ſemitone or key, and the other Fa the 4th. How well ſoever this may anſwer the purpoſe of tuning the half-tones in a ſharp key; yet in a flat key, the places of the half-tones being the 3d and 6th, will, according to to this order, be expreſſed by La, the ſemitone ſyllable Fa conſequently expreſſing whole tones.

To obviate this difficulty, and reduce things to order, another place of Mi muſt be aſſigned, which is the 2d of a flat key: for this Fa will expreſs the ſemitones on the 3d and 6th.

It is evident then, that before any half-tone or whole-tone can be tuned, the firſt buſineſs muſt be to find out the place of this mi: now how this can be done by virtue of the ſound, or name, or order of theſe ſyllables, is not ſo eaſy to comprehend.

But admitting the place of mi, or the key, to be known by ſome previous precept, as indeed ought to be; yet tuning the key as the firſt ſemitone in a ſharp 3d, and the 3d as the firſt ſemitone in a flat key, is beginning at the wrong end in the firſt caſe, and thereby not marking the eſſential difference of tune, which conſiſts in the flat and ſharp 3ds, the order of which is diſturbed by this variation of the place of mi.

From this want of marking the eſſential difference in tuning by theſe ſyllables, and wherein the beginning and ending is not on the key, ſome confuſion and much trouble and untunableneſs muſt ariſe. And indeed it cannot be imagined, that this or any other eſſential difference of things can be marked by the ſame invariable artificial ſigns, if they be not exactly accommodated to the nature of things. An invention that fails in this, however ingenious it may be in ſpeculation, not being a juſt repreſentation of nature, doth not merit the name of art.

For inſtance, if you tune eight notes, whoſe key hath a ſharp 3d beginning on the 5th, your ſeventh note, which is the 4th of the key, and therefore a whole tone from the ſucceeding note, will ſound like the flat 7th. Again, if you begin to tune on the 2d, your 3d, which is the 4th of the key, is flat; and the ſound in this ſucceſſion will appear as if you were tuning in a flat key.

And again, if you tune from the 6th, the deception of a flat 3d is the ſame as in the laſt caſe.

Secondly, if you tune 8 notes whoſe key hath a flat 3d, and begin on the 7th, your 3d, which is the 2d of the key, is ſharp, and your tuning will be as if in a ſharp key.

The ſame deception will appear if you begin to tune on the 3d or 6th.

In a word, whatever other interval you begin on, to tune either with flat or ſharp 3d except the key, ſome ſemitones will be out of their places: This is rendering what is at firſt ſight attended with ſome difficulty, more perplexed and obſcure.

The ear, the judge of ſounds, is deceived, and the judgment miſled.

But on the other hand, the ear will naturally and eaſily diſtinguiſh the flat and ſharp key, when the key and its 3d are aſcertained by beginning and ending on the key.

But otherwiſe, and where theſe marks are promiſcuouſly uſed, the difference of tune, or infallible ſign, will appear neither to the ear nor underſtanding.

We ſhall end theſe remarks with one general obſervation; which is, that by aſſigning the place of mi to the greater 7th or 2d, in order to find out the key, is reſolving one difficulty by a greater, and requiring to do a thing without any means of information offered to compaſs it.

For as it is true that when the greater 7th or 2d is known, the key is known alſo, and again, the key being given, you have conſequently the 7th or 2d; yet to do either of theſe, without ſome intermediate helps, is taking for known the thing ſought, which is directly contrary to reaſon.

Proceed we now to our method of ſinging by note.

The firſt principle of ſinging, is the finding the places of the two ſemitones in the octave, in any given key.

This

This hath been pointed out in general, in the theory, where are ſhewn the places of the ſemitones in the ſharp key to be the 4th and 8th, and in the flat key the 3d and 6th.

But the particular names of the notes, on which the ſemitones fall in any key whatſoever, and which it is evident muſt depend on the name of the key, are demonſtrated, and examples given, in the practice, under the article of Tranſpoſition.

We ſhall therefore transfer only the examples into this place, in a conciſe order, which will fully anſwer our inquiry into the names and places of the ſemitones.

The nine ſharp keys. No. 106.

The ſeven flat keys. No. 107.

By theſe examples the particular names of all the ſemitones are known at ſight; as they depend on the name of the key.

Therefore in the example of the ſharp keys; the firſt key being C, the ſemitones are F and C.

The ſecond G; the ſemitones C and G.

The third D; the ſemitones G and D, the 4th and 8th of each reſpectively.

In the example of the flat keys; the firſt being A, the ſemitones are C and F,

The ſecond D; the ſemitones are F and B flat.

The third G; the ſemitones B flat and E flat. And ſo on, the 3ds and 6ths reſpectively.

To apply this to the purpoſe of tuning the notes by the voice: At ſight of the ſharps or flats prefixed to the tune to be ſung, and looking at the key-note, you have of courſe the places of the ſemitones, by referring theſe to the original in the examples ſet above.

Having thus diſcovered the difference of tune, you are at the ſame time determined whether you are to tune the notes of the octave with a flat or ſharp 3d.

This tuning of the eight notes, tones and ſemitones, in their due order, is the firſt ſtep or principle of tuning all other intervals, or of ſinging by note.

It will moſt readily be learned by imitating another voice, or following the notes of an inſtrument; this is the only caſe wherein there is need of any foreign aſſiſtance to ſinging by note.

The inſtrument we would recommend for this purpoſe is the organ or harpſichord; as the 4 or 5 ſemitones, which aſcertain the flat or ſharp 3d, ſucceeding each other, being viſible on the keys of that inſtrument in any part, the learner can in this caſe aſſiſt himſelf, by ſtriking the notes of the octave in either flat or ſharp key, on any part of the inſtrument which will beſt ſuit the pitch of his voice, and diſtinctly repeating them by turns, until his ear is become a perfect judge of the difference of the flat and ſharp 3d, as well deſcending as aſcending, and his voice perfect in tuning both.

As muſical ſounds will be beſt expreſſed in tuning by articulate ones; we ſhall, to anſwer this convenience, take the four ſyllables already in uſe.

As we ſhall apply them to another purpoſe than they ſerve at preſent; ſo the order or manner we ſhall diſpoſe them in, will be altogether different from that.

In tuning, then, the notes of the octave with the inſtrument, let the ſyllables be expreſſed with the notes, in the order of the following examples.

In G ſharp. No. 108.

Now, ſince the flats or ſharps adjuſting the ſemitones of any ſharp key are exactly the ſame which belong to the flat key reſpectively on the 6th, as we have ſaid before in comparing the examples of flat and ſharp keys in tranſpoſition; therefore the eight notes aſcending in a flat key will have the ſyllables annexed to each, as in the following example on the 6th, without diſturbing or departing from the order of the ſharp.

In E flat. No. 109.

The ſemitones and the tones below them being diſtinguiſhed by the ſyllables fa and mi, in their reſpective places in both keys, for deſcending as well as aſcending notes, is the ſole uſe we intend by theſe ſyllables; the tuning of the notes, which is to be learned by the inſtrument, being entirely independent of them.

For tuning the deſcending notes then, there need no other examples than the two above written; for reading the ſame backwards will ſerve this purpoſe.

When the ear becomes well acquainted with tuning the notes of the octave by the inſtrument, it will then be proper to ſing the ſame looking on the notes written on the book; and this ſhould be done in every example of both keys. And let it be remembered, that tuning the notes thus in the natural order, ſhould be to a beginner the prelude to ſinging any ſong propoſed.

The next ſtep will be, before the learner attempts to ſing any part of a ſong, to tune by the notes the greater intervals, both concord and diſcord.

The general rule for which is, Tune all the notes of the interval in the natural order, aſcending if the interval aſcend, and deſcending if the intervale deſcend. Then immediately tune both notes of the interval, beginning with the concords.

Thus. No. 110.

Concords in ſucceſſion.

The diſcords are. No. 111.

The ſemitone being the diſtance between the 3d and 4th, is already known by tuning the notes of this interval.

Note, The name of every greater 7th introduced by a ſharp prefixed, is mi.

Next tune the concords of the thirds in ſucceſſion. In this manner. No. 112.

The 4ths and 5ths being all perfect and like, except one of each, need no repetition.

The 6ths in ſucceſſion are tuned thus. No 113.

Laſtly, mix the diſcords and concords as they ſtand in the natural order; than which nothing will better confirm the juſt tuning of the intervals, when theſe rules are to be applied to future practice.

In this manner. No. 114.

This line may be tuned various ways; as, ſecondly, beginning ſtill on the left hand, tune the 3d and 2d notes, reading backwards; and ſo on, each two under the ſlur.

Again, beginning on the right hand, tune the uppermoſt note and ſecond downwards; then the firſt and third; and ſo

ſo on, ſtill miſſing one, and omitting conſtantly the G, or key not below.

And laſtly, beginning ſtill on the right hand, tune the ſecond and firſt, the third and firſt, the fourth and firſt, and ſo on, omitting the G or key note conſtantly.

The practice of tuning the notes deſcending of all theſe examples, is by reading the ſame backwards.

The tuning the greater intervals in the flat key depending in like manner on tuning the eight notes in ſucceſſion, according to that ſeries; it is unneceſſary to ſet examples of the ſame.

The ſame method of practice equally ſerving this key, except that the ſyllables annexed to this key muſt be repeated, as in the proper example 109.

As in this example of the intervals of the 3d, 6th, and 7th, wherein this key differs from the ſharp. No. 115.

The general rule of tuning the intermediate notes of each interval firſt likewiſe taking place here.

In order to eſtabliſh theſe rules in the memory, and render them of immediate ſervice to the practitioner, eſpecial notice muſt be taken of the flat and ſharp thirds, as alſo of the flat and ſharp ſixths, in what places they ſtand, or how they ſucceed each other in the order of the key.

The not attending to theſe differences being the only obſtacle that can ſtand in the way of ſinging at ſight, ſee them ſet down at large in the theory, and in the examples of this chapter, No. 112, 113.

When theſe are well recorded in the memory, together with the ſharp 4th or flat 5th, the art of ſinging by note will not appear ſo myſterious. This knowledge of the intervals at ſight will render the ſyllables of little or no uſe, as hath been obſerved, and eſpecially if words be ſet to the airs you intend to practice; which we would adviſe.

When the interval of each note is known at ſight by conſtant practice, and the ſound of every interval become familiar to the ear, and thereby diſtinguiſhed immmediately upon hearing the ſame, the learner may make an eſſay to ſing by note ſome plain ſong; which is no more than tuning the ſame intervals, with which he is ſuppoſed to be well acquainted in the foregoing leſſons.

For as to any other article of knowledge requiſite to the performance of the ſong; as the time of the movement, and lengths of the notes, and the like; if the practitioner hath not been acquainted with them by practice on ſome inſtrument beforehand, the principles of them have been delivered in few words in the introduction to this eſſay.

But beſides that this is not the place for ſpeaking of theſe matters, ſo neither is there occaſion for this knowledge in the very beginning, in ſtrictneſs of ſpeaking; it being adviſable for a beginner to ſtudy the tuning the intervals of the ſong, without reſpect to any other affection of the ſounds; and when he is maſter of this, to add the practice of the lengths of the notes, as a ſecond conſideration.

We ſhall here ſet the notes of a plain ſong, in order to make ſuch application of the rules as may be an introduction towards the further execution of them. No. 116.

Firſt, find out the key, by looking at the laſt or key note; then ſee whether it hath a flat or ſharp 3d.

The key of this example being G, with one ſharp prefixed, is a ſharp key; being the ſecond inſtance in the examples of the nine ſharp keys.

Therefore tune the notes of the octave aſcending, and deſcending, in a ſharp 3d. Immediately after tune the concords in ſucceſſion. After that, tune the concords of the 3ds, aſcending and deſcending. This will be prelude enough for fixing your attention and ear to the 3ds of the key, and for pitching your voice. Having repeated this two or three times, begin the ſong in the ſame pitch or key wherein you ſung the prelude. For nothing contributes more to ſinging in tune, than frequent repetition of notes in one key. Therefore, if your voice be rightly pitched in the prelude, ſeek not to change it in the ſong.

The two firſt notes in the example are Fa, Mi: which interval, it is preſumed, you can tune at ſight. If otherwiſe, you muſt have recourſe to the general rule, and tune the intermediate note of that interval aſcending, thus, Fa, ſol, mi; immediately repeating the interval you want to ſound, thus, Fa, Mi.

The next note is the 2d, or Sol, which may be tuned from Mi, the laſt note, by deſcending; or from the key, as it hath an equal reference to both. We have laid before you this choice in conſideration of your firſt attempt. But when from experience you are become more perfect in tuning the intervals, the moſt approved way will be, to make the laſt note you ſung relative to the ſucceeding one, whoſe interval you are to tune. Whereby your ſinging an air will be no other than tuning the intervals as they ſucceed each other in the movement of the ſong; which you practiſed often before in the natural order, and with which you are ſuppoſed to be well acquainted.

The fourth note in the example being Sol, and a 4th to the laſt note you ſung, you will now tune a perfect 4th; not conſidering this note in relation to the key, to which it is a 5th; but in relation to the laſt ſounded note Sol, to which it is a 4th.

This is the method you will purſue in every interval after ſome improvement gained by practice. Notwithſtanding, it will be convenient ſometimes to have recourſe to the key, by ſounding it, and taking the interval from the ſame; whereby you will ſing better in tune by keeping to the pitch or key you began in; particularly if the interval from the laſt note be a great one, or diſcord, or lie near the key, above or below.

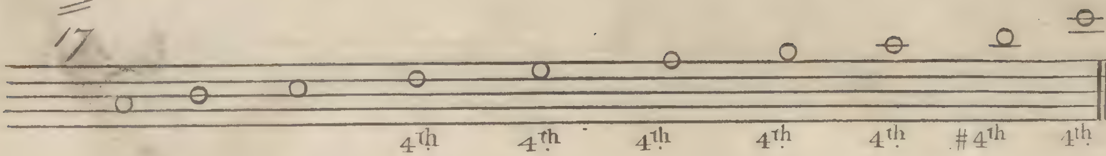
To ſum up all; every new note introduced, or not belonging to the harmony of the key, bearing the proportion of ſome concord or diſcord, to the preceding note or to the key, will come within the rules laid down, and therefore needs no repetition.

On the principles of the theory and practice of muſick, we ſhall now demonſtrate the art of tranſpoſing with the voice, or ſinging in any cliff at ſight, wherewith it may happen a perſon is not acquainted; and this from the knowledge of ſinging in any other cliff.

THEO-


N 1
major
minor
femi-tone
major
minor
major
femi-tone
2
major
femi-tone
minor
major
femi-tone
minor
major
3
Sharp Flat
4th
♯3d
♭3d
♯6th
♭6th
Semitones
4
5
6
7
♭d ♯c
♮d
♭e ♯d
♮e
♮f ♯e
♭g ♯f
♮g
♭a ♯g
♮a
♭b ♯a
♮b
♮c ♯b
1 2 3 4 5 6 7 8 9 10 11 12 13
8
Key
tone 2
tone 3
femitone 4
tone 5
tone 6
tone 7
femitone 8
9
Key
tone 2
femitone 3
tone 4
tone 5
femitone 6
tone 7
tone 8
10
Key
2d
3d
4th
5th
6th
7th
8th
11
tone
5th
8th
12
♯3d ♭3d ♭3d ♯3d ♯3d ♭3d ♭3d
13
4th 4th 4th ♯4th 4th 4th 4th
14
5th 5th 5th 5th 5th 5th ♭5th
15
♯6th ♯6th ♭6th ♯6th ♯6th ♭6th ♭6th
16
♭3d ♭3d ♯3d ♭3d ♯3d ♯3d

17



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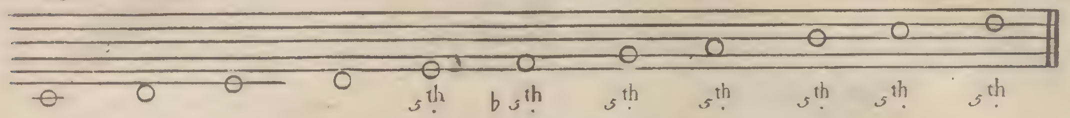

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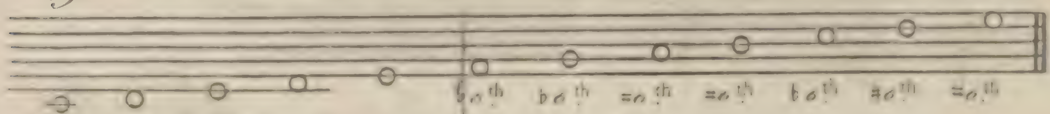

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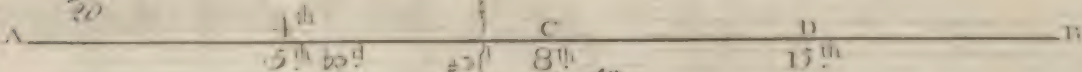

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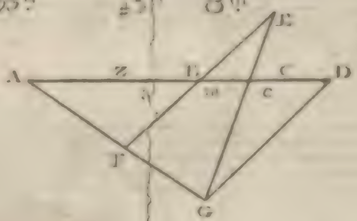

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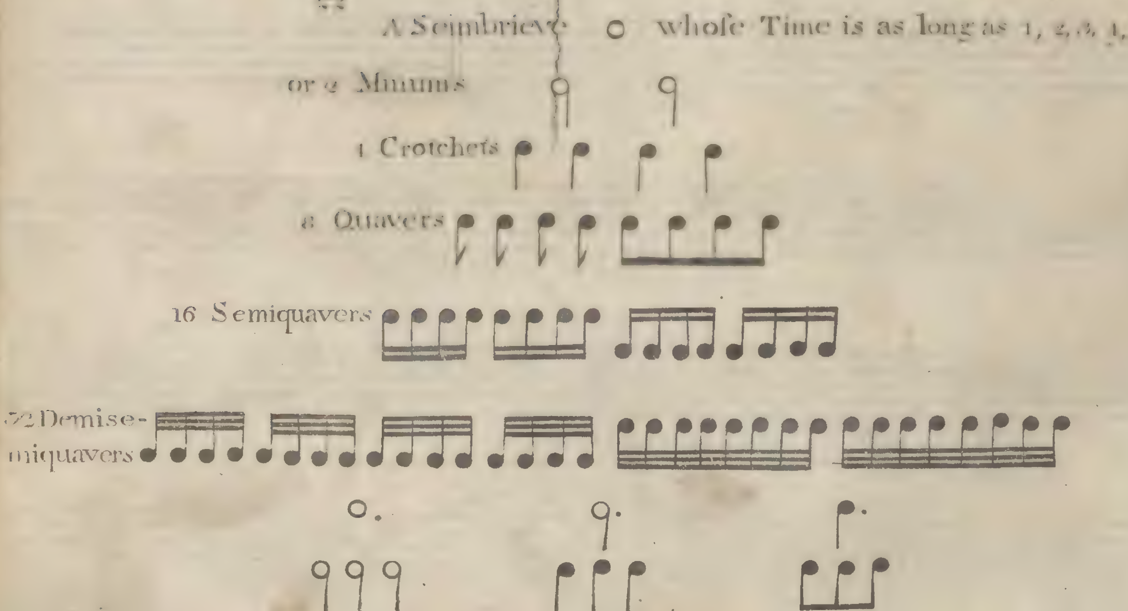


Plate CXIX

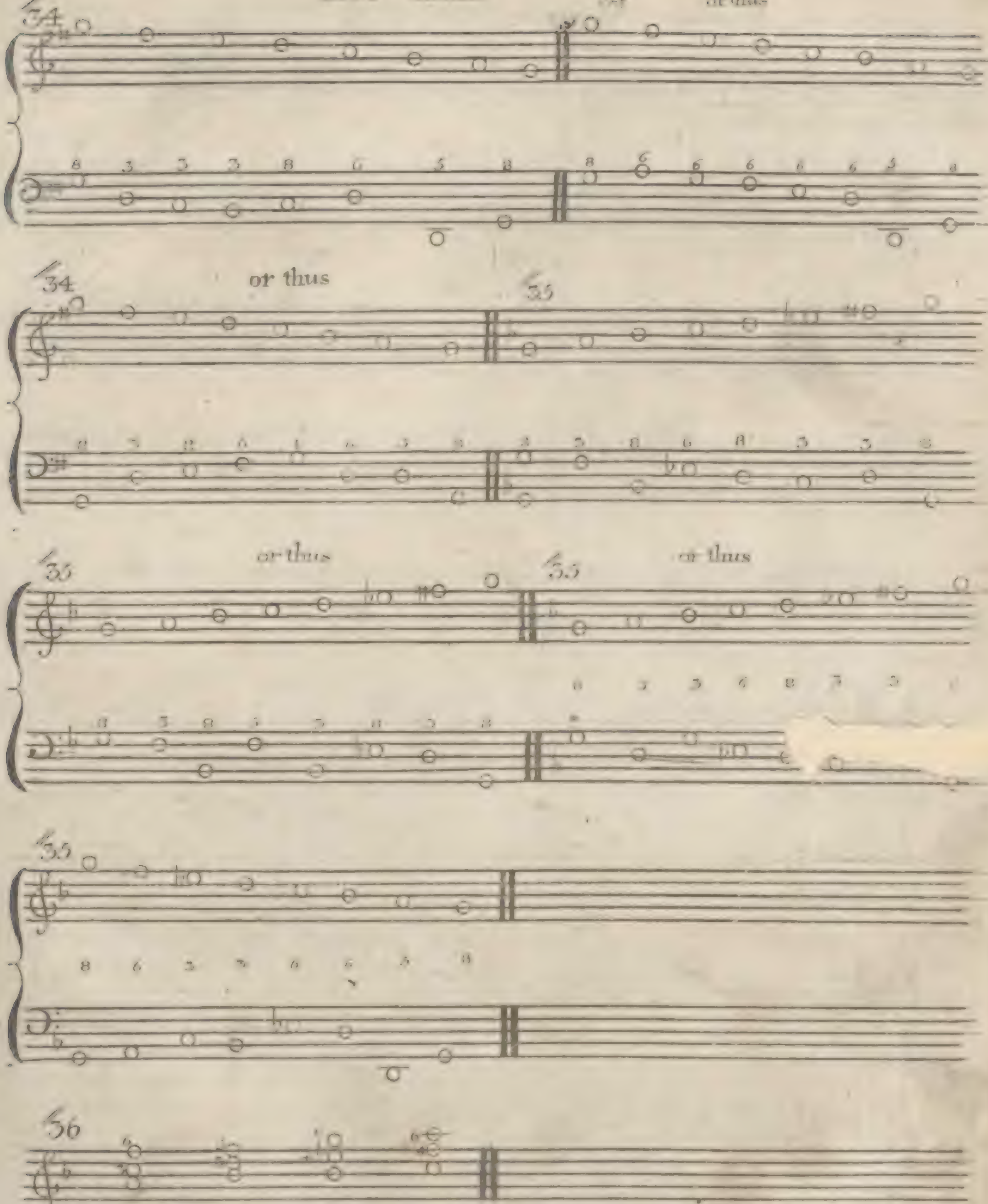


Plate. CXX.

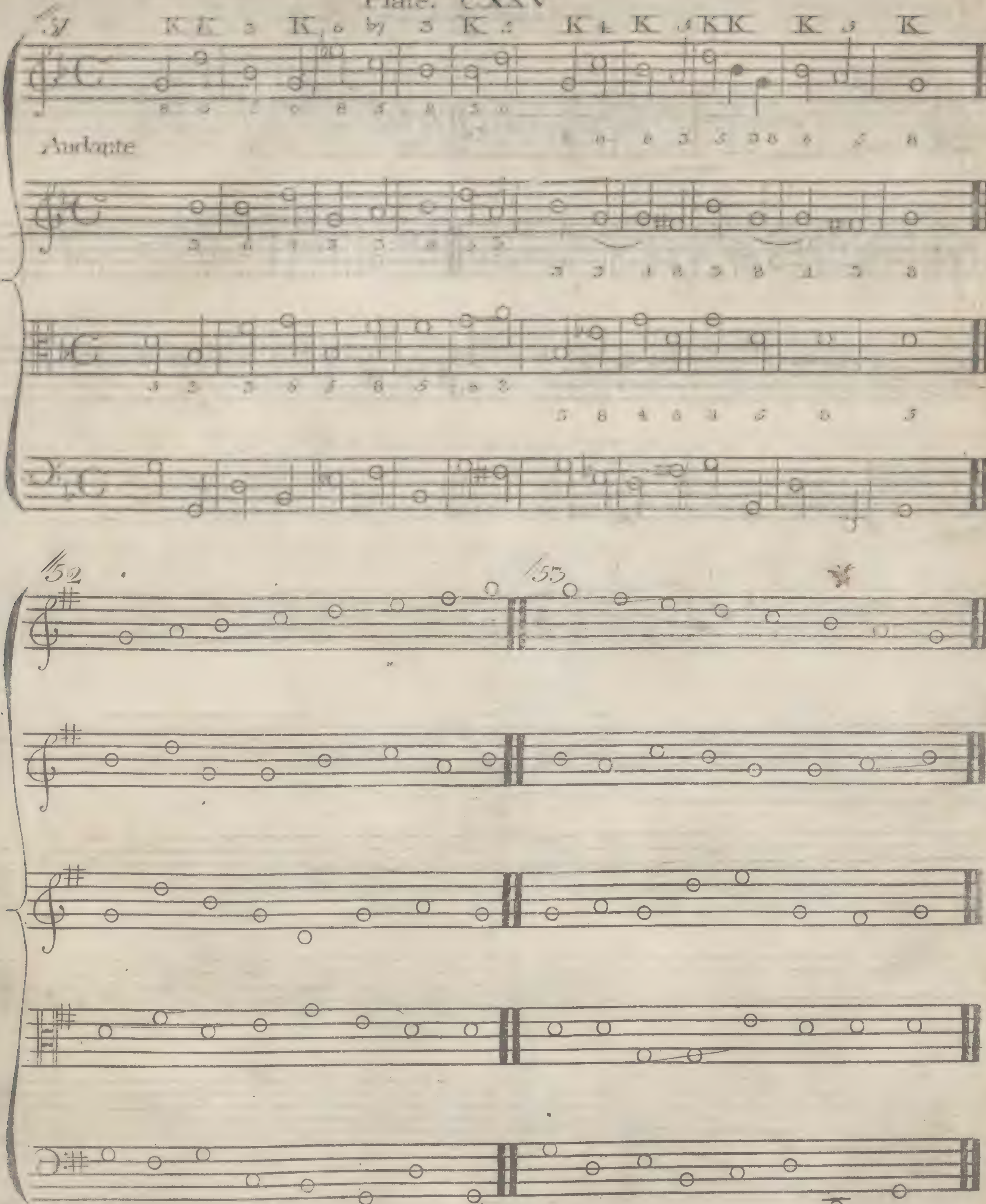
Plate. CXXI.


Moderato
or thus


or thus
Plate. CXXIII
43
44
45
46
47
or

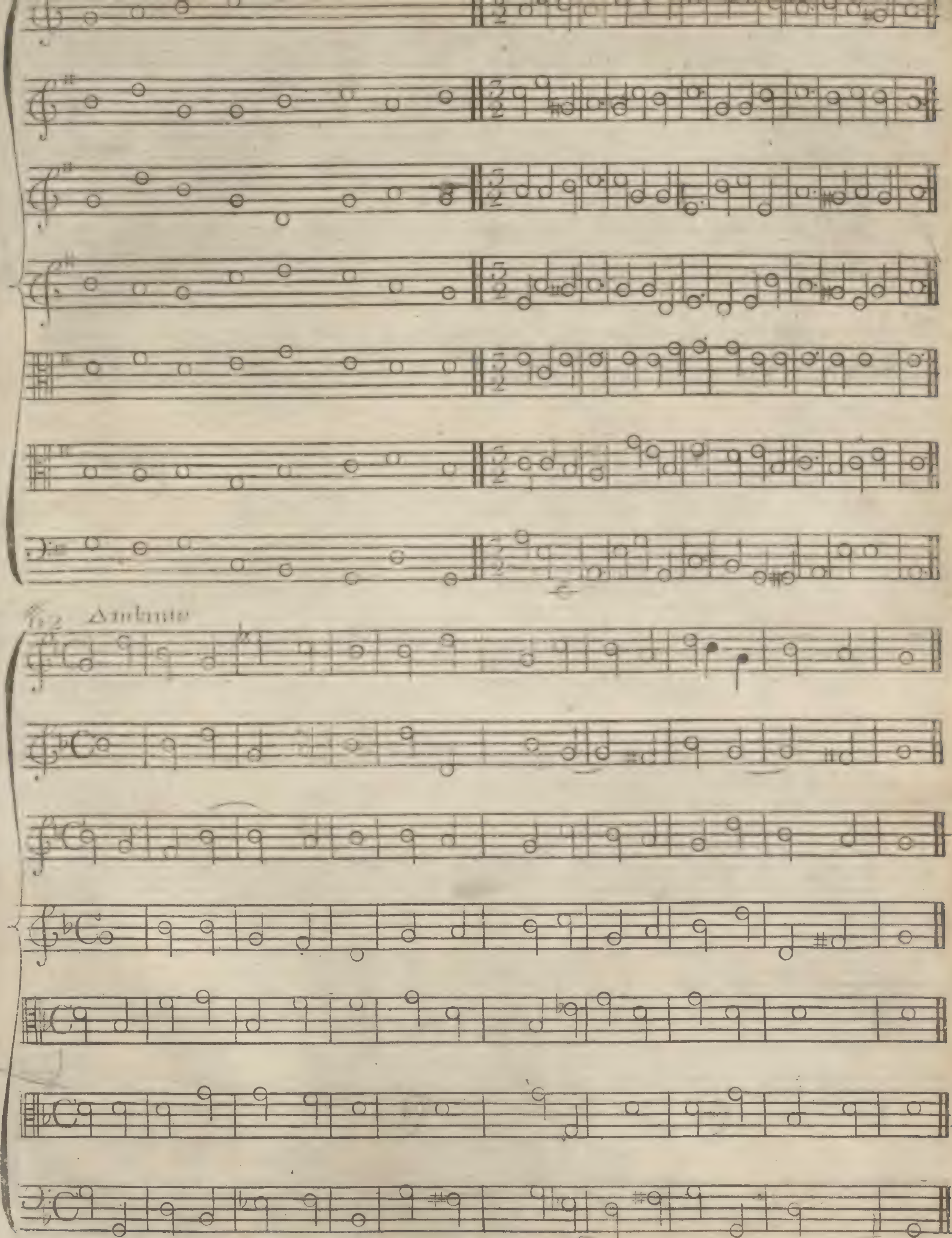
Plate.CXXIIII.

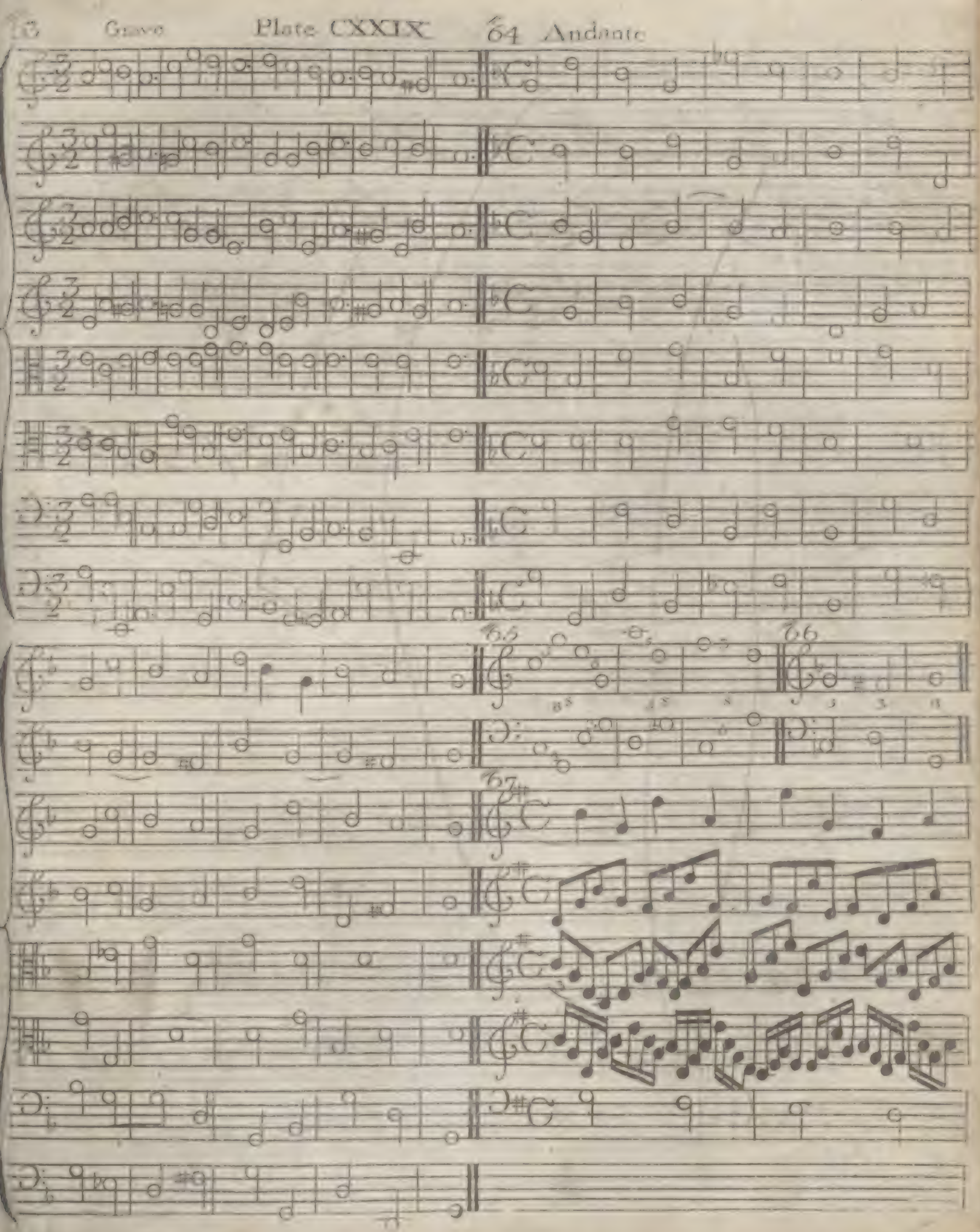
Plate. CXXV



54 Grave Plate. C XXVI. 55 Andante

39. Andante


Andante


63 Grave
64 Andante
65
66
67

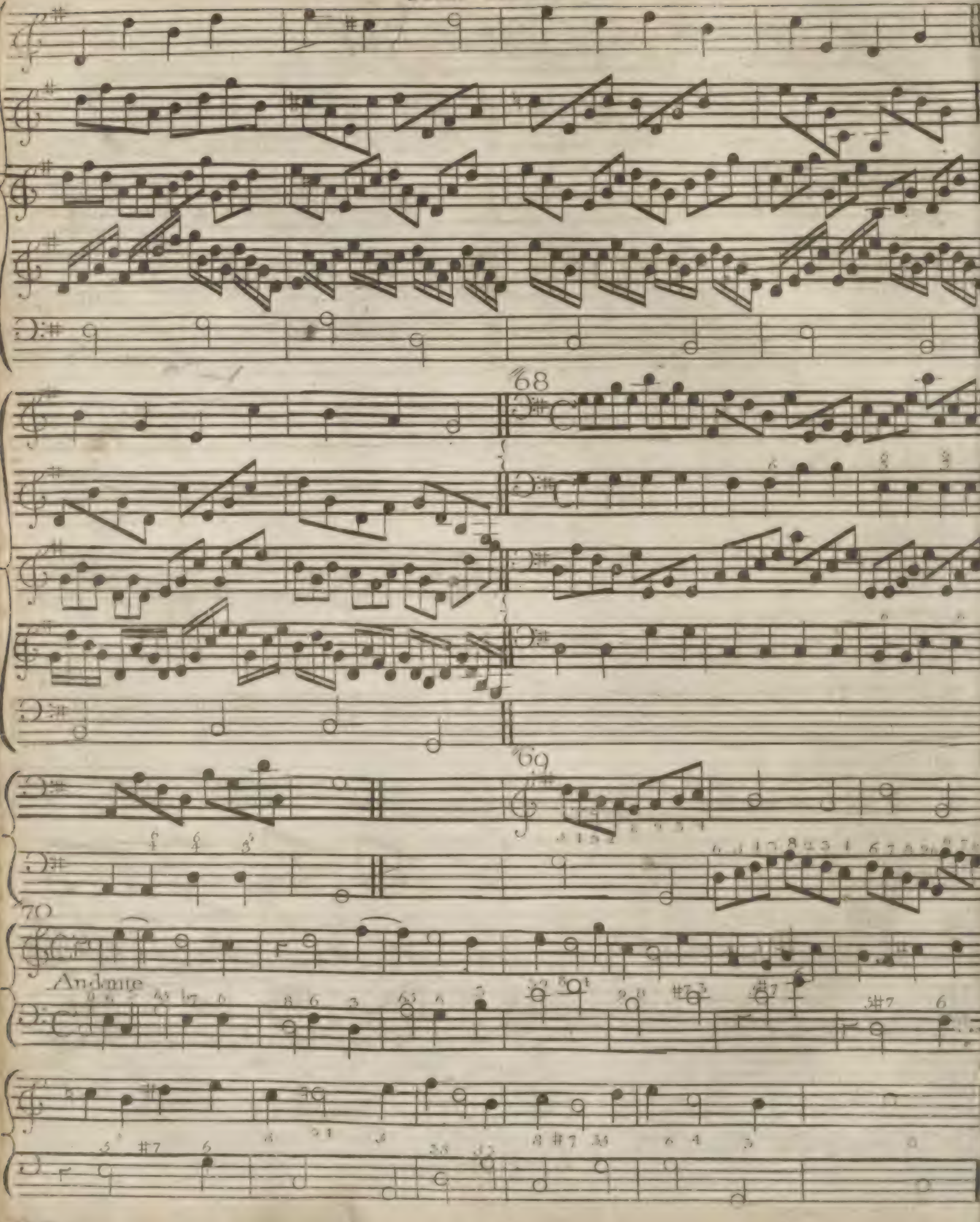
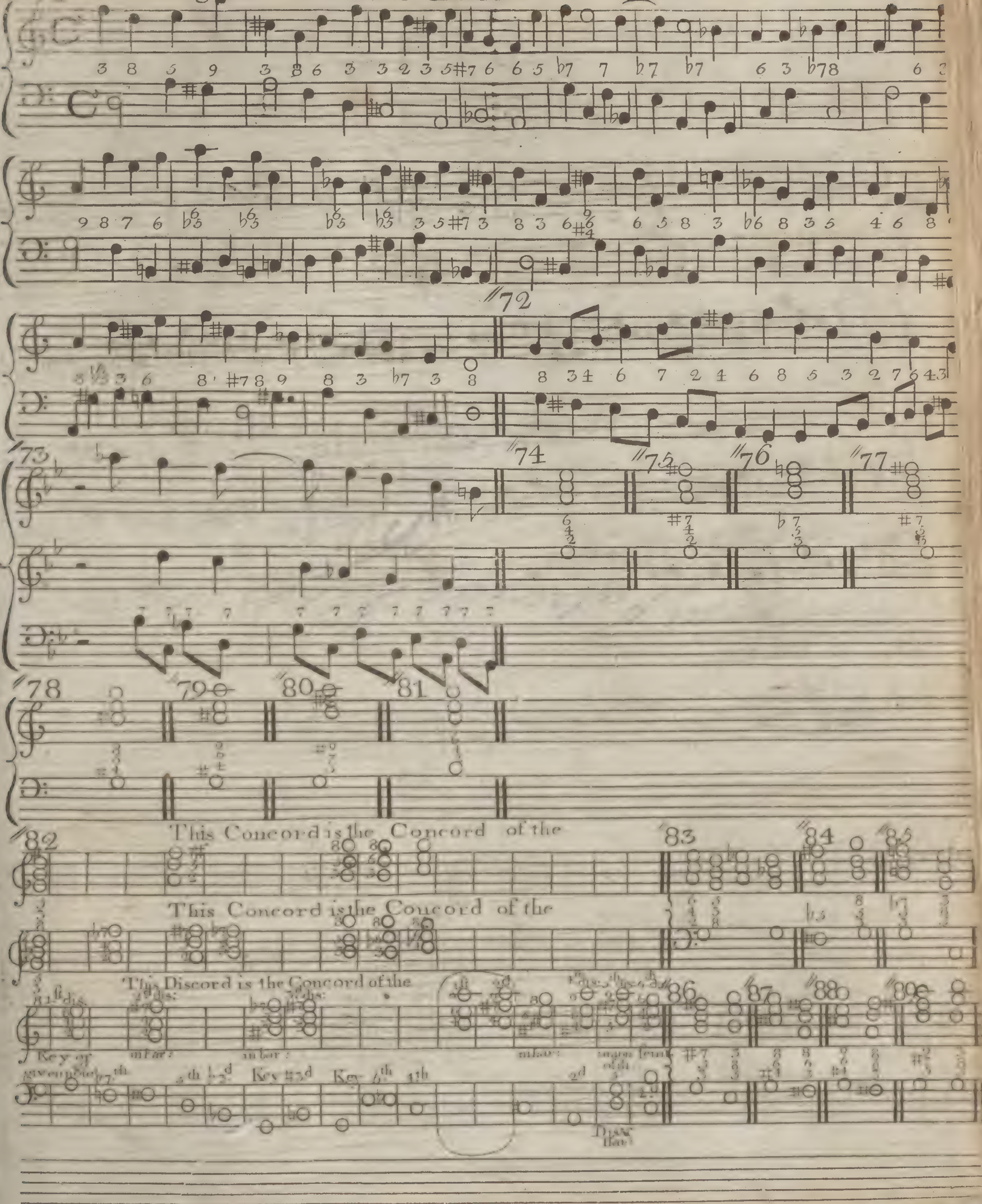
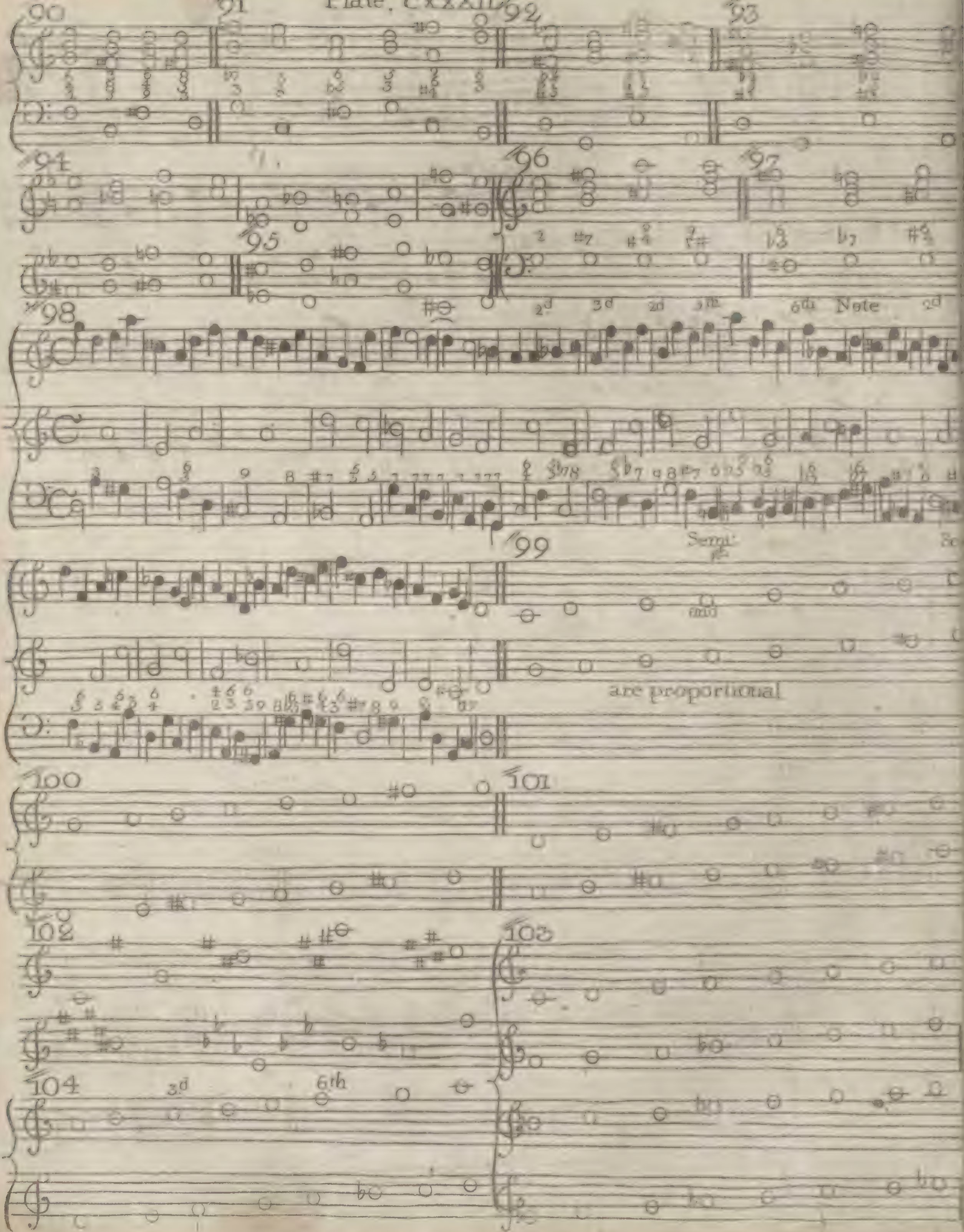
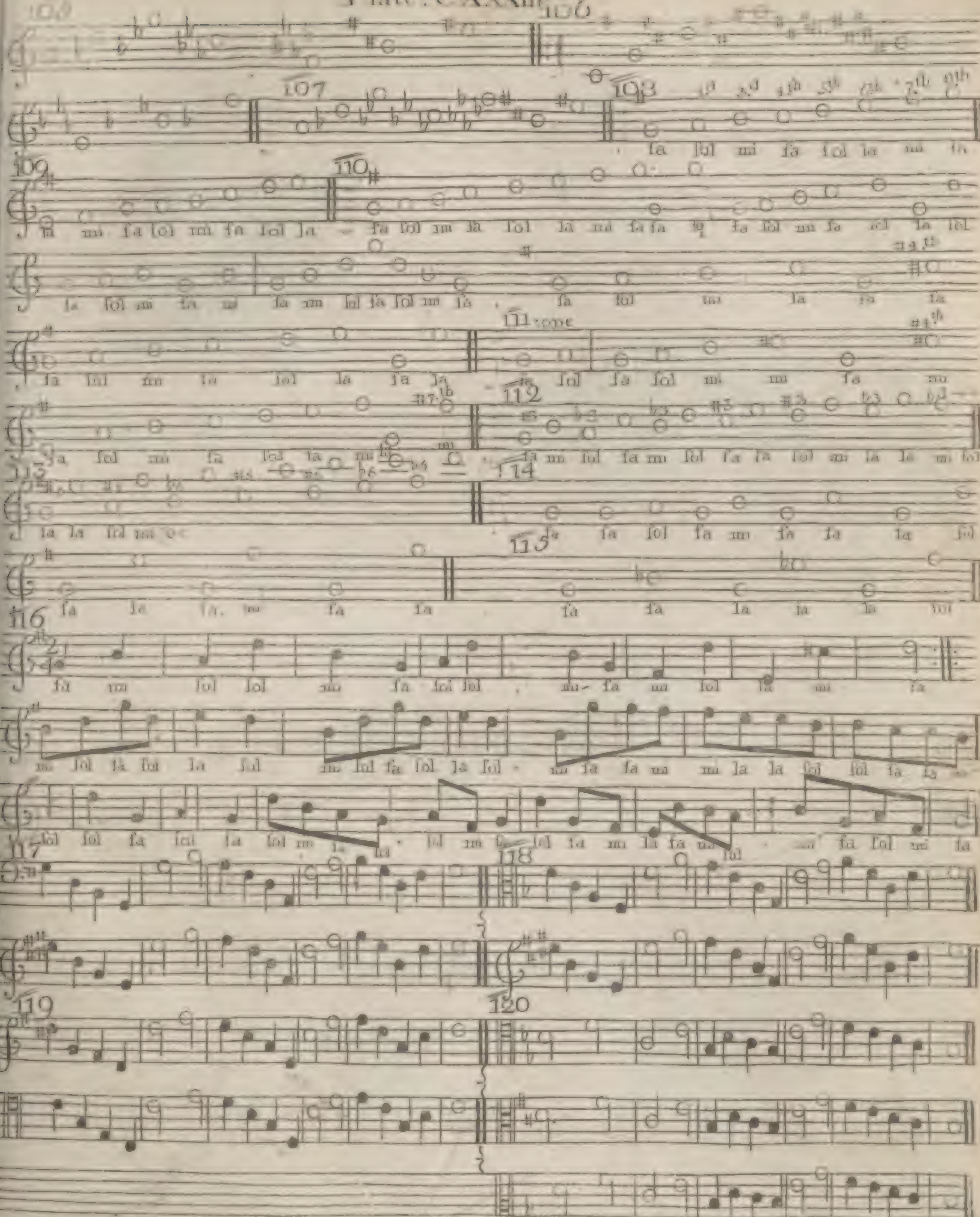

68
69
70
Andante

Plate. CXXXI.


Allegro assai
This Concord is the Concord of the
This Concord is the Concord of the
This Discord is the Concord of the
Key of
Key #3d
Key 6th

Plate, CXXXII.




106
107
108
109
110
111
112
113
114
115
116
117
118
119
120

Theorem. The intervals of the notes of all ſharp keys and flat keys reſpectively, are proportional. Therefore, the ſinging at ſight in an unknown cliff will be by tranſpoſing out of the given cliff, into that you are acquainted with.

This is done by naming the key in the cliff you are to tranſpoſe into, and diſtinguiſhing whether the ſong hath a flat or ſharp 3d, compared to the examples of the nine ſharp and ſeven flat keys in uſe, knowing the name of each cliff. Now, the name of the baſs cliff is F, of the tenor C, and of the treble G.

Let it be required to ſing the notes in the following example in the baſs cliff unknown; tranſpoſed into the treble with which you are acquainted. No. 117.

The notes in the uppermoſt line, in the baſs cliff, are in G.

In the ſecond line and treble cliff, they are in E.

Demonstration. By the rules of tranſpoſition they are the ſecond and fifth inſtances in the ſharp key; then they are proportional: if proportional, the ſemitones are preſerved in their proper places: but keeping or ſinging the ſemitones in their places, is tuning the notes of the octave right; therefore this tranſpoſition from the baſs cliff into the treble is ſinging by note right.

The ſame example in the tenor. No. 118.

The notes of the tenor are in F; thoſe of the treble in E. But they are the ninth and fifth inſtances of ſharp keys, therefore proportional; and if proportional, *&c.*

Again, let the treble be the unknown cliff. No. 119.

The notes of the treble are in D. of the tenor in C. they are the third and firſt inſtances of ſharp keys; therefore proportional, *&c.*

This demonſtration from proportion extends to all poſſible caſes, and therefore makes the propoſition univerſal.

The laſt example ſhall be in the tenor cliff, ſet in the uſual places, and in a flat key. No. 120.

In the upper ſtave the key is G.

In the ſecond, B.

In the third, D. But theſe keys are the third, the ſixth and ſecond inſtances of the ſeven flat keys; hence they are proportional: therefore ſinging them in this proportion is preſerving the ſemitones; and therefore ſinging them right.

On theſe principles, it is apprehended, the art of ſinging by note is rendered intelligible, and the performance tolerably eaſy; and this eſpecially by removing the difficulties which have taken their riſe from the manner of delivering the precepts, and from the uſage of variety of cliffs: difficulties, which are the effects, we may ſay, of too much art, and for this reaſon perhaps the more perplexing; for whatever of this kind may ariſe from the nature of the ſubject of any ſcience, the ſame may by attention and ſtudy in time be ſurmounted, ſuch caſes lying open to every one's inquiry; it being the buſineſs of every ſearcher into nature to contemplate the things themſelves, and to make the beſt uſe of ſuch diſcoveries as offer themſelves towards the further improvement of ſcience.

MUSK, a dry, light, and friable ſubſtance, of a dark blackiſh colour, tinged with purple; it is a kind of perfume of a very ſtrong ſcent, and only agreeable when in a very ſmall quantity, or moderated by the mixture of ſome other perfume. It is found in a kind of bag or tumour which grows under the belly of the moſchus moſchiferus. See Moschus.

Muſk is brought to us ſewed up in a kind of bladders or caſes of ſkin of the bigneſs of a pigeon's egg, or larger, each containing from two or three drams to an ounce of muſk. Theſe are covered with a browniſh hair, and are the real capſules in which the muſk is lodged while on the animal. That which is unadulterated appears in maſſes, of looſe and friable granules, which are ſoft to the touch, and eaſily crumble between the fingers, feeling ſomewhat ſmooth and unctuous.

Muſk taken inwardly produces eaſe from pain, quiet ſleep, and a copious diaphoreſis: hence it has been found of great uſe in ſpaſmodic diſorders, petechial, malignant, putrid fevers, the jail diſtemper, hiccoughs, *&c.* and Dr Wall obſerves, that it has been found uſeful in ſpaſmodic diſorders, given by way of clyſter. The operation of muſk in ſome reſpects reſembles that of opium; but it does not leave behind it any ſtupor or languidneſs, which the latter often does. Muſk likewiſe ſeems likely to anſwer in thoſe low caſes where ſleep is much wanted, and opiates are improper. It is ſaid to be beſt given in a bolus, in which form thoſe who are moſt averſe to perfumes may take it without inconvenience. Fifteen grains or more are now given in a doſe with great ſucceſs.

MUSKET, a fire-arm born on the ſhoulder, and uſed in war. The length of a muſket is fixed at three feet eight inches from the muzzle to the pan, and it carries a ball of ſixteen to the pound.

MUSKETOON, a kind of ſhort thick muſket, whoſe bore is the thirty-eighth part of its length: it carries five ounces of iron, or ſeven and a half of lead, with an equal quantity of powder. This is the ſhorteſt ſort of blunderbuſſes.

MUSLIN, a fine ſort of cotton cloth, which bears a downy knap on its ſurface. There are ſeveral ſorts of muſlins brought from the Eaſt-Indies, and more particularly from Bengal; ſuch as doreas, betelles, mulmuls, tanjeebs, *&c.*

MUSSÆNDA, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel-ſhaped; it has two thickiſh ſtigmata; the berry is oblong, and the ſeeds are diſpoſed into four ſeries. There is but one ſpecies, a native of India.

MUSSELBOROUGH, a port-town of Scotland, in the ſhire of Lothian, ſix miles eaſt of Edinburgh.

MUSTARD, in botany. See Sinapi.

MUSTELLA, in zoology, a genus of quadrupeds of the order of feræ. There are ſix erect, ſharp, diſtinct teeth in the upper jaw, and an equal number in the under jaw, but blunter and cloſer together, and two of them are ſituated a little farther within the mouth; and the tongue is ſmooth. There are 11 ſpecies, *viz.* 1. The lutris, with the hind-feet palmated, and the tail about one fourth of the length of the body. It is found in Aſia and North America. 2. The lutra, or otter, has palmated feet, and a tail about one half of the length of the body. This animal is exceedingly voracious; but is fonder of fiſh than of fleſh. He ſeldom quits the banks of rivers, and can remain a conſiderable time below water. The female comes in ſeaſon in the winter, and brings forth three or four young in March. This animal is found in moſt countries of Europe and North America. 3. The lutreola has hairy palmated feet, and a white mouth. It is a native of Finland, and feeds upon frogs and fiſhes. 4. The barbata, is of a reddiſh colour; and the toes are not connected with a membrane. It is a native of Brazil. 5. The gulo is of a duſky red colour, and blackiſh on the middle of the back. It is found on the woody mountains of Lapland, Ruſſia, and Siberia. The gulo is a very voraceous animal, and devours hairs, birds, *&c.* He has an abominable odor; but his fur is very precious. 6. The martes, or marten, is of a blackiſh yellow colour, with a pale throat, and the toes are not webbed. This animal is a native of the ſouthern parts of Europe; it frequents the woods, and feeds upon ſquirrels, mice, and birds. 7. The putorius, or pole-cat, has unconnected toes, is of a dirty yellow colour, with a white mouth and ears. This animal is very deſtructive to birds and poultry. He conceals himſelf during the day; but ſteals into barns, dove-cotes, hen-houſes. *&c.* in the night, in order to catch his prey. He is a native of moſt parts of Europe. 8. The furo, or ferret, has red eyes, and unconnected toes. This animal is eaſily tamed, and frequently employed to hunt rabbits out of their holes. The female is leſs than the male, and brings forth twice in the year, 5 or 6 at a litter. It is a native of Africa. 9. The zibellina has divided toes; the body is of a duſky yellow colour, with a white forehead, and an aſh-coloured throat. It is found in Tartary, and the northern parts of Aſia. 10. The erminea has divided toes; and the point of the tail is red. The ſkin of this animal is a valuable fur, and of a fine white colour. It is a native both of Europe and Aſia, and particularly of the northern climates. It feeds upon mice, eggs, *&c.* and has a very offenſive ſmell. 12. The nivalis has divided toes, and a white body. It is very ſimilar to the ermine, but about one half leſs in ſize. It is found in Ruſſia and the northern parts of Europe. See Plate CV. fig. 3. and Plate CVI. fig. 1, 2, 3, 4.

MUTE, in a general ſenſe, ſignifies a perſon that cannot ſpeak, or has not the uſe of ſpeech.

MUTE, in grammar, a letter which yields no ſound without the addition of a vowel. The ſimple conſonants are ordinarily diſtinguiſhed into mutes and liquids or ſemi vowels.

MUTILATION, the retrenching or cutting away any member of the body.

MUTILATION, in Scots law. See LAW, Tit. xxxiii.

MUTULE, in architecture, a kind of ſquare modillion ſet under the corniche of the Doric order.

MUTUUM, or LOAN, in Scots Law. See LAW. Tit. xx. 7.

MUZZLE *of a gun or mortar*, the extremity at which the powder and ball is put in; and hence, the muzzle-ring is the metalline circle, or moulding, that ſurrounds the mouth of the piece.

MYAGRUM, in botany, a genus of the tetrandria ſiliculoſa claſs. The pod is terminated with a conical ſtylus, and generally contains but one ſeed. There are nine ſpecies, only one of which, *viz.* the ſativum, or gold of pleaſure, is a native of Britain.

MYCONE, one of the iſlands of the Archipelago, about twenty-five miles in circumference, ſituated in E long. 25°. 6′, N. lat. 37°.

MYLOGLOSSUM, in anatomy. See ANATOMY, p. 304.

MYLOHYOIDÆUS, in anatomy. See ANATOMY. p. 304

MYOLOGY, that part of anatomy which treats of the muſcles of the human body. See ANATOMY, Part II.

MYOPIA, ſhort-ſightedneſs, a ſpecies of viſion, wherein objects are ſeen diſtinctly only at ſmall diſtances. See OPTICS.

MYOSOTIS, in botany, a genus of the pentandria monogynia claſs. The coroliary conſiſts of 5 emarginated ſegments. There are four ſpecies, only one of which, *viz.* the ſcorpioides, or mouſe-ear ſcorpion-graſs, is a native of Britain.

MYOSURUS, in botany, a genus of the pentandria polygynia claſs. The calix conſiſts of five leaves connected at the baſe; it has five ſubulated, petal-ſhaped nectaria; and the ſeeds are numerous. There is but one ſpecies, *viz.* the minimus, or mouſe-tail, a native of Britain.

MYRIAD, a term ſometimes uſed to denote ten thouſand.

MYRICA, in botany, a genus of the diœcia tetrandria claſs. The amentum of the male has a lunulated ſcale; the corolla is wanting both in the male and female; the female has two ſtyli; and the berry contains only one ſeed. There are five ſpecies, none of them natives of Britain.

MYRIOPHYLLUM, in botany, a genus of the monœcia polyandria claſs. The calix of both male and female conſiſts of four leaves, and none of them have any corolla: the male has eight ſtamina, and the female four piſtilla; and there are four naked ſeeds. There are two ſpecies, both natives of Britain, *viz* the ſpicatum, or ſpiked water-millfoil; and the verticillatum, or verticillated mill-foil.

MYRMECOPHAGA, in zoology, a genus of quadrupeds belonging to the order of bruta; the characters of which are theſe: There are no teeth in the mouth; the tongue is long and cylindrical; the head terminates in a long ſnout or muzzle; and the body is covered with

with pretty long hair. There are 4 ſpecies, *viz.* 1. The didactyla, or white American coati of Seba, has two toes on the fore-feet and four on the hind feet. This animal is about 7 inches long; the head is two inches in length; the ſnout is not ſo long as that of the other ſpecies; the tail is about an inch longer than the body, and covered with pretty long hair; the legs are not made for walking, but jumping. He climbs trees, and hangs on the branches by the extremity of his tail. In this ſituation he thruſts his long tongue in the holes or fiſſures of trees, and brings it out covered with ants or other inſects. He can live long without nouriſhment of any kind, ſleeps generally in the day, and ſearches for food in the night. 2. The tridactyla, tamanduaguaca, or tamanoir, has three toes on the fore-feet, and five on the hind-feet, and long hair on the tail. This animal is about four feet long, and the head and ſnout about fifteen inches: It is a native of the Eaſt Indies, and feeds upon ants, *&c.* in the ſame manner as the didactyla. See Plate CXVI. fig. 4.—3. The jubata, has four toes on the forefeet and five on the hind ones, and a very hairy tail. This animal reſembles the tridactyla, and is found at the Cape of Good Hope. 4. The tetradactyla, has four toes on the fore-feet and five on the hind, with a tail naked at the extremity. It is a native of ſouth America.

MYROBALANS, a kind of medicinal fruit brought from the Indies, of which there are five kinds: 1. The citrine, of a yellowiſh-red, hard, oblong, and the ſize of an olive: 2 The black, or Indian myrobalan, of the bigneſs of an acorn, wrinkled, and without a ſtone: 3. Chebulic myrobalans, which are of the ſize of a date, pointed at the end, and of a yellowiſh brown. 4 Emblic, which are round, rough, the ſize of a gall, and a dark-brown: and, 5. Belleric, which are hard, round, of the ſize of an ordinary prune, leſs angular than the reſt, and yellow. Each of theſe kinds are ſlightly purgative and aſtringent; but Quincy obſerves, that the beſt of them are not worth regarding, ſince they rather clog than aſſiſt any compoſition.

MYRRH, a vegetable production of the gum or reſin kind, iſſuing by inciſion, and ſometimes ſpontaneouſly, from the trunk and larger branches of a tree growing in Egypt, Arabia, and Abyſſinia. The inciſions are made twice a-year, and the myrrh ouzing out is received on ruſh-mats diſperſed underneath.

Myrrh is ſent over to us in looſe granules of various ſizes, from that of a pepper-corn, to the bigneſs of a walnut. The generality of them, however, are from the ſize of a pea, to a little more than that of a horſebean: theſe are ſometimes roundiſh, but often irregularly long and contorted. The colour of myrrh is a reddiſh-brown, with more or leſs of an admixture of yellow, and in the pureſt pieces it is ſomewhat tranſparent. Its taſte is bitter and acrid, with a peculiar aromatic flavour, but very nauſeous: but its ſmell, though ſtrong, is not diſagreeable. It is to be choſen in clear pieces, light, friable, and of the bittereſt taſte. Myrrh is of great uſe in medicine; it powerfully reſolves and attenuates thick and viſcid blood, and concreted bile, and glutinous humours, and is good in obſtructions of the menſes, and in infarctions of the viſcera.

MYRSINE, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of five ſegments; and the berry has five cells and five ſeeds. There is but one ſpecies, a native of Æthiopia.

MYRTIFORM, in anatomy, an appellation given to ſeveral parts, from their reſembling myrtle-berries.

MYRTLE, in botany. See MYRTUS.

MYRTUS, the MYRTLE, in botany, a genus of the icoſandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; and the berry contains two or three ſeeds. There are 13 ſpecies, none of them natives of Britain.

MYSIA, the ancient name of a province in Aſia, being the north-weſt part of Natolia or Aſia Minor.

MYTHOLOGY. The word *mythology* is a Greek compound, that ſignifies *a diſcourſe on fables;* and comprehends, in a collective ſenſe, all the fabulous and poetic hiſtory of pagan antiquity. It follows therefore, that this ſcience teaches the hiſtory of the gods, demi-gods, and fabulous heroes of antiquity; the theology of the pagans, the principles of their religion, their myſteries, metamorphoſes, oracles, *&c.* By this definition, it appears ſufficiently what are the objects of which we are to treat in this article.

If we well conſider the matter, we ſhall find, that there were, in pagan antiquity, three different religions. Firſt, That of the philoſophers, who treated metaphyſically of the nature, the attributes, and of the works of the Supreme Being. They endeavoured to diſcover the true God, and the manner in which he ought to be worſhipped. It is not wonderful, that theſe men of exalted genius ſhould in ſome degree ridicule, in their works, the two other poſitive religions, and thoſe gods on whom they were founded; at the ſame time that they outwardly profeſſed the eſtabliſhed religion, in order to preſerve the peace of ſociety, and to avoid the perſecutions of the legiſlature, and the inſults of the populace. For in fact, was it poſſible for them to believe the pagan fables? Muſt they not foreſee, that their religion would one day give place to another, while their own works would paſs with their names to the lateſt poſterity? And could they ſuffer the thought, that their reputation would be tarniſhed in the eyes of that poſterity, by having it imagined they believed ſuch idle tales as were broached by the prieſts of their times? Could Plato, Socrates, Seneca, and Cicero, be unconcerned for their fame among future generations, and future philoſophers? And what ſhould we at this day have ſaid of thoſe great men, had they been ſo political, or hypocritical, as to have entirely concealed their ſentiments with regard to theſe matters?

The ſecond religion was that of paganiſm, which was the eſtabliſhed religion of all the ancient nations except the Jews. This was the doctrine that was taught by the prieſts, and protected by the ſovereigns. Its dogmas were demonſtratively falſe, but not always ſo abſurd as may at firſt appear, eſpecially if we annex to the divinities, and to the religious ceremonies of the pagans, a ſenſe that is frequently myſtic, and always allegoric; if we remember,

that the firſt heathens deified thoſe great men to whom the reſt of mankind were indebted for any ſignal benefits, as Jupiter, Apollo, Ceres, Bacchus, Hercules, Æſculapius, *&c.* in order to induce others, as well of the preſent as future ages, to reverence and to imitate them. Would not an ancient pagan, if he were to return upon the earth, have ſpecious arguments, at leaſt, to ſupport his religion, when he ſaw weak mortals beatify or canonize, merely by their own authority, other weak mortals (frequently mere pedants,) and place them in heaven, without the permiſſion or approbation of the Supreme Being? Happy is it for mankind, when at different times ſagacious pontiffs purge the calendar, and the brains of the people, from a herd of pretended ſaints, and prevent them, at leaſt after their death, from doing injury to ſociety, by interrupting the induſtry of the laborious inhabitants with keeping their feſtivals.

The third religion was idolatry, or the religion of the populace. For the common people. born to be deceived in every thing, confounding in their imaginations the ſtatues of the gods, the idols of their divinities, the emblems of their virtues and of religious worſhip, with the gods, divinities, virtues and worſhip themſelves, adored theſe images, and proceeded to extravagancies the moſt ridiculous, and frequently moſt criminal, in their ceremonies, feaſts, libations, ſacrifices, *&c.* It is to be feared, that, as long as there are upon the earth men of our limited capacities, this triple religion will conſtantly ſubſiſt under different forms; and we are much deceived, if it may not be found under the empire of Chriſtianity itſelf, notwithſtanding the purity of its doctrine. It will be eaſily conceived, that it is not of the religion of philoſophers, nor that of the populace, of which we are to treat in this article of Mythology; but of that which ſubſiſted under the authority of the magiſtracy and the prieſthood, and conſequently of paganiſm in general.

As far as we are able to judge by all the ancient authors we have read, the pagans adored the ſovereign Lord of the univerſe under the name of *Fate* or *Deſtiny*, which we muſt not confound with *Fortune*, who was regarded as a ſubaltern divinity. Jupiter himſelf, all the gods, every animated being, the heavens, the earth, the whole frame of nature, was ſubſervient to Deſtiny, and nothing could reverſe its decrees. This divinity was ſo highly adorable, as to be above all rank; and was regarded as too ſupreme to be repreſented under any ſenſible image or ſtatue, or to have any temple erected for its worſhip. We do not remember to have read, that any ſacrifice was ever offered to this Deſtiny, or that any temple or city was ever dedicated to its name. We are almoſt inclined to think, that the pagans were ſenſible, that the temple and the worſhip of the God of gods ought to be in the heart of man. Mention is made, indeed, of a temple that was dedicated to the Unknown God, but we are ignorant whether or not Deſtiny were thereby meant. We muſt not confound this Deſtiny, moreover, with the goddeſs of chance, of which there are ſome antique ſtatues that repreſent her in a recumbent poſture, and playing with little bones; for this was nothing more than an invention of ſome ſtatuary.

After this general and philoſophical idea of the Supreme Being, comes the poſitive religion of the pagans. This was entirely founded on fable, which took its riſe either from ancient traditions, or hiſtorical events, altered or augmented by the imaginations of the poets, by ſuperſtition, or by the credulity of the people; or elſe it conſiſted of allegoric or moral fictions. A crowd of writers, and among the reſt *Noel le Comte*, (Natalis Comes,) the abbots Banier and Pluche, *&c.* have made many reſearches into the origin of fable: and they think they have diſcovered its ſource, 1. in the vanity of mankind; 2. in the want of letters and characters; 3. in the deluſive eloquence of orators; 4. in the relations of travellers; 5. in the fictions of poets, painters, ſtatuaries, and dramatic writers; 6. in the diverſity and uniformity of names; 7. in the ignorance of true philoſophy; 8. in the foundation of colonies, and the invention of arts; 9. in the deſire of having gods for our anceſtors; 10. in the imperfect or falſe interpretation of the holy ſcriptures; 11. in the ignorance of ancient hiſtory; 12. in a like ignorance of chronology; 13. in that of foreign languages; 14. in the tranſlation of the religion of the Egyptians and Phœnicians into Greece; 15. in the ignorance of geography; and, 16. in the belief that the firſt people had of the intercourſe of gods with men. It is certain, that all theſe matters taken together are ſufficient to produce many thouſands of fables; are more than ſufficient to enable us to deceive ourſelves and others, and to give riſe to infinite reveries. But we ſhould take care how we draw from theſe ſources demonſtrations that might be uſed, by infidels, as arguments to overthrow the hiſtory of the Jews; a people the moſt ſtupid, moſt credulous, and oſtentatious of all others. In the mean time, the pagan philoſophers themſelves aſſerted, that it was a god who invented the fable: ſo much they were convincined of its ingenuity, and of its ſtrong tendency to inſtruct mankind in their duty.

Mythology therefore, when properly treated, begins with making learned reſearches into the real origin of fable, of paganiſm, and of that idolatry which was its conſequence. It recurs for this purpoſe even to the beginning of the world: and after finding that Laban, the father-in-law of the patriarch Jacob, was a maker of idols; and that he had his little images, or houſhold-gods, which he formed of baked earth, and which ſhews that idolatry exiſted in the greateſt antiquity; it then explains *coſmogony*, and *theogony*, or the belief that the firſt inhabitants of the earth entertained of the creation of the univerſe, and what the pagan theology taught of the genealogy of their falſe gods. It begins with the tradition of the Chaldeans, a people ſo ancient, that Nimrod was their firſt king; but at the ſame time ſo credulous and ſuperſtitious, that we may regard them as the authors of all thoſe fables, and the propagators of all thoſe viſions, that have ſince blinded human reaſon. According to this tradition, a monſter named *Oannes*, or *Oes*, half fiſh and half man, ſprang from the ſea, before the chaos was completely diſperſed, and gave laws to the Chaldeans. A woman called *Omorka*, reigned over all the earth. *Bel* cut her in two, and made of one moiety the heavens, and of the other the earth. They likewiſe invented the two primitive beings, of which the good one, who was named *Oraſmaſdes*, had the direction

tion of heaven; and the other, called *Arimanius*, that of hell.

The ſcience of mythology then teaches the theogony of the Phœnicians; concerning whom it draws great lights from Sanchoniathon, a prieſt of Beryte, who lived before the Trojan wars, more than four hundred years before Heſiod and Homer, and of whom Euſebius has preſerved conſiderable fragments. From thence it paſſes to the theogony of the Egyptians; of whom *Thot* or *Thaut*, the founder of that nation, was likewiſe, they ſay, their firſt hiſtorian; that Sanchoniathon even copied from him; and of whom we find many relations in the Greek hiſtorians, eſpecially in Herodotus, Diodorus Siculus, and in Euſebius of Cæſarea. It then examines the theogony of the Atlantides, who dwelt on the weſtern part of Africa, and of whom Diodorus alone has preſerved any account. From thence it proceeds to the theogony of the Greeks, which is far better known to us, as we find accounts of it, more or leſs particular, in numberleſs Greek and Latin writers. This theogony had the ſame foundation as that of the Romans; the latter having only extended it, by adding to the Greek divinities certain gods or demigods, formed of their heroes, and certain ſymbolic and allegoric divinities, which mythology explains at the ſame time: and it is on this occaſion that it enters into a particular explication of the coſmogony and theogony of Ovid; whoſe book of metamorphoſes contains as copious deſcriptions as we could deſire of the fables of the ancients: what was their belief concerning the habitations of the bleſſed after their death, or of the Elyſian fields; as well as of their hell or tartarus; of the dog Cerberus; of the ferryman Charon; of the furies; of the four rivers, Cocytus, Lethe, Phlegethon, and Styx, which water the tartarian regions, *&c.* The learned have likewiſe made many inquires, and many ingenious diſcoveries, concerning the theogony of the ancient Germans, Celts, the Scythian and Hyperborean nation. In the laſt place, this ſcience furniſhes great lights on the theogony of the Bramins, the Troglodytes, the Indians, the Chineſe, and even the Americans; all which it concludes with a regular and minute examination of the pagan theology, and particularly that of the poets.

All theſe matters being well digeſted in the minds of thoſe who would make a regular ſtudy of pagan theology, they continue their reſearches into the time, the epoch and place of the real origin of paganiſm and idolatry; and they prove that the pagans began by adoring the heavenly bodies, the ſtars and planets. They next examine into the progreſs of idolatry: what were the temples of the pagans, their altars, their incloſures, their ſacred groves, their aſylums, the idols and ſtatutes of their deities; in what manner they were repreſented; what were their ſacrifices, the victims that were offered; what were the ſacred veſſels, the cenſers and other inſtruments that were uſed in the ſacrifices, libations, and other religious ceremonies: concerning the prieſts, prieſteſſes, and other attendants on the ſervice of each divinity: what were the feſtivals that were celebrated among the Greeks and Romans, as well as among the orientals; what the days of penitence and ſupplication, the feaſts or the gods of lectiſternia, their invocations or incantations, and exorciſms, the religious ceremonies obſerved at laying the foundations of cities, *&c.*

Divination, or the prediction of future events, a weakneſs that has at all times poſſeſſed the human mind, forms alſo an important article of pagan theology. It is therefore in this place, that mythology conſiders the nature of *Oracles*; and in particular, 1. The oracle of Dodono, the moſt ancient of Greece; 2. That of Jupiter, Hammon or Ammon, in Libya; 3. That of Jupiter Philius; 4. That of Apollo, both of Heliopolis; 5. That of Apollo of Delphos; 6. That of Trophonius in Bœotia, 7. That of Venus of Aphaca, a country between Byblos and Heliopolis, ſituate on a ſmall lake; and a great number of other oracles of leſs note, diſperſed over Greece and other countries. It alſo examines in what manner theſe oracles gave their anſwers, the ceremonies that were obſerved in conſulting them, the frantic emotions of the prieſteſs Pythia on her tripod; and thoſe of other prieſts. It then endeavours to determine if there ever were in fact any Sibyls, which, whatever has been ſaid, is ſtill very doubtful; it draws, however, from all the ſources of antiquity, a kind of hiſtory of theſe Sibyls, and of their prophecies. It next paſſes to the examen of the nature of auguries, auſpices, haruſpices, preſages, prodigies, and phenomena, of expiations and ablutions, of the magic and aſtrology of the ancients, *&c.* Whoever has throughly ſtudied all theſe objects, is fully provided with the preliminary knowledge that is neceſſary to enable him to proceed ſteadily and ſecurely through the darkneſs of ancient mythology, and he may thereby advance more confidently to the examination of the nature of the pagan divinities themſelves.

The celebrated treatiſe of Cicero *De natura Deorum* will here furniſh great lights: but modern authors who have treated on theſe matters, have not been contented with this alone: they have, ſo to ſay, extracted the eſſence of all antiquity, of which they have formed ſyſtems; but unluckily theſe ſcarce ever agree with each other. As philoſophers, it is of very little importance for us to know what was the nature of theſe gods, ſeeing we know that they were merely fabulous: but as hiſtorians and antiquaries, it concerns us to know what was the nature that was attributed to them in general; and, in particular, what were the origin, genealogy, rank, functions, authority, and operations, that were attributed to each divinity; and it is on theſe matters that we have ſtill ſome remarks to make.

The gods of the ancient Greeks and Romans were all either *Dii majorum gentium*, or *Dii minorum gentium*; that is, of the firſt or ſecond order. The former were alſo called *conſentes*, *magni conſultores*, &c. According to Ennius they were twelve in number, and are included in theſe verſes:

> Juno, Veſta, Minerva, Ceres, Diana, Venus, Mars,
> Mercurius, Jovis, Neptunus, Vulcanus, Apollo.

To theſe were added eight others under the title of *ſelecti*, which were Sol, Luna, Tellus, Genius, Janus, Saturnus, Liber, and Pluto. The ſecond order, or *minorum gentium*, were called Adſcriptitii, Medioximi, Minuſcularii, Putatitii, Indigetes, Semones, *&c.* the principal of which were Æſculapius, Bacchus, Caſtor, Fauna, Hercules,

les, the Lares or Penates, Pollux, Quirinus, Semo Saneus or Dius Fidius, *&c.*

According to the second division, all their divinities were classed into, 1. Celestial gods, 2. Terrestrial gods, 3. Sea gods, and 4. The Infernal deities, or *inferi*. The celestial gods were Jupiter, Juno, Apollo, Aurora, Cupid, Cybele, the Graces, Hebe, Iris, Luna, Mars, Mercury, Minerva, Nemesis, Saturn, Themis, Venus, *&c.* The terrestrial gods were Æolus, Astræus, Astræa, Ceres, Diana, the Fauni, Feronia, Flora, Janus, Momus, the Muses, Pales, Pan, Pomona, Priapus, the Satyrs, Silenus, Silvanus, the god Terminus, Vesta or Rhea, Berecynthia, Vulcan, Harpocrates, *&c.* The sea-gods were Neptune, Amphitrite, Thetis, Canopus, Glaucus, Ino, the Nereids, Nereus, Oceanus, Palæmon, Triton, *&c.* The infernal gods were Pluto, Proserpine, Charon, Minos, Æacus, Rhadamanthus, the Furies, Death, Night, the Fates, Plutus, *&c.*

The third division ranged the divinities according as they presided, 1. Over the pregnancy of women (*Prægnantium*;) 2. At parturitions (*Parturientium*;) 3. At births (*Nascentium*;) 4. At adulteries; 5. At marriages: To which they added, 7. Dii morales, or moral gods; and 7. Funeral gods. The gods of pregnancy were Pilumnus, Intercidona, and Deverra: the gods of parturition, Juno, Lucina, Diana, Egerio, Prosa, Postverta, Menagenata, Latona, the gods that were called Nixi, or of labour, *&c.* The gods of birth were Janus, Opis, Nascion, Cunina, Carmenta, Vaginianus, Levana, Rumia, Potina, Educa, Ossilago, Carnea, Nundina, Statilinus, Fabulinus, Paventia, *&c.* The gods of adultery were Juventus, Agenoria, Strenua, Stimula, Horta, Quies, Murcia, Adeona, Abeona, Voluptas, Orbona, Pellonia, Numeria, Camoena, Sentia, Angerona, Heres, Martea, Laverna, the god Averruncus, Consus, Catius, Volumnus and Volumna, Honorius, Aius Locutius, *&c.* The nuptial gods were Diana, Domiduca, Domitius, Hymenæus or Hymen, Jugatinus, Jupiter perfectus, Juno perfecta, Juno cinxia, Juna unxia, Lucina, Manturna, Mutinus, Dea Mater prima, Suada, Thalassius, Venus, *&c.* The moral gods were called Virtus, Honor, Fides, Spes, Justitia, Pietas, Misericordia, Clementia, Pudicitia, Veritas, Mens, Concordia, Pax, Salus, Felicitas, Libertas, Pecunia, Risus, Invidia, Contumelia, Impudentia, Calumnia, Fraus, Discordia, Furor, Fama, Fortuna, with all their epithets good or bad, Febris, Pavor and Palor, Paupertas, Necessitas, Tempestas, Silentium, *&c.* The funeral gods were Pluto, Libitina, Nænia, Death, the Fates, *&c.*

Hesiod indeed pretends that all these gods derived their origin from chaos; but we have already pointed out more just sources. It is almost incredible to what a prodigious number the superstition and weakness of the Greeks and Romans multiplied these divinities: there have been thirty thousand of them enumerated. It will not be expected that we should here attempt to describe them, nor will it be remarkable if we have forgot to mention even some of the first rank: Although, vast as this company of gods is, mythology does not omit to trace the history of the greatest part of them, as is taught by paganism; and they who are desirons of particular information in these matters may consult with advantage the theogony of Hesiod, the catalogue of Apollodorus, the metamorphoses of Ovid, the fables of Hygina, Lylii Gregorii Gyraldi Syntagma de Diis Gentilium, the mythology of Natalis Comes, the books of Gerard Vossius de Idolatria Gentilium, Johannis Boccatii Genealogia Deorum, the Pantheon of Pomey, the history of heaven by Abbe Pluche, the historic explanation of fables by Abbe Banier, and numberless other works of the same kind in all languages.

There were still many other distinctions, of which the pagans made use to mark the rank, the functions and nature of their several divinities. For example, the goddess Vesta, or the mother of all the gods, was adored by all people in general. Mars, Bellona, Victoria, Fortunata, *&c.* assisted all parties. The topical gods, on the contrary, were adored in particular countries only; as Astarte in Syria, Derceto and Semiramis among the Assyrians, Isis and Osiris by the Egyptians, Quirinus at Rome, *&c.* The title Semones, which was given to a certain class of divinities, was doubtless derived from Semi-homines, that is, demi-men; and signified the same as semi-dii, or demi-gods. These were monarchs and illustrious heroes, or those great men who were the founders of cities and nations, that were deified by way of apotheosis. Pythagoras had taught the Chaldeans the doctrine of transmigration; and that, after their death, those who were virtuous would be elevated to the rank of divinities. This doctrine was adopted by all the pagan world. The apotheosis, after they had erected temples and altars to the new gods, was celebrated with much solemnity. In the last ceremony, an eagle was fixed on the catafalk, or funeral pile, on which was placed the image of the hero; and when the pile began to burn, the eagle was let loose, who, mounting into the air with the flames, seemed to carry the soul of the departed hero up to heaven.

Mythology informs us also, who those persons were that antiquity regarded as the children of the gods, such as Theseus, Hippolytus, Paris, *&c.*; what the pagans believed with regard to the nature of their Genii and Demons, of their Dryades, Hamadryades, Nymphs, Tritons, Sirens, Fauns, Sylvans, Centaurs, and other subaltern divinities; and in this manner it explains all the systems of the positive religion of the Greeks and Romans. They who are desirous of extending their knowledge of paganism still further, of knowing the dogmas of each particular people, what were their gods, and the various manners in which they were worshipped, such as Apis, Isis, Osiris, *&c.* the adoration of crocodiles and onions, *&c.* among the Egyptians, must study the different theogonies of these people; and notwithstanding all the informations which ancient and modern authors afford, this study is yet boundless, and attended with many difficulties and uncertainties: Though it appears demonstrative, that the origin of paganism, and of idolatry in general, was derived from the Chaldeans, from whom the Egyptians drew that doctrine which they after transmitted to all other nations; and consequently that the primordial divinities were the same, under different denominations, among all the idolatrous nations of the earth.

The nature of this work will not permit us to descend to further particulars. But to give our readers an idea of

of the manner in which mythology treats its ſubjects, and of the method that ſhould be obſerved in ſtudying fable, or the hiſtory of the gods of antiquity, we ſhall here give, by way of example, a curſory deſcription of Parnaſſus and its inhabitants.

Parnaſſus was a mountain of Phocis, that had two ſummits, one of which was called Tithoreus, and the other Hyampeus. Others ſay, that one of theſe hills was named Helicon, and the other Cytheron; and that it is an error to imagine, that Helicon was a mountain of Bœotia. However that be, this double hill was conſecrated to Apollo and the Muſes, who there held their uſual reſidence. According to fable, there had been a remarkable combat on this hill, between Helicon and Cytheron. Whoever ſlept on Parnaſſus, when he waked, became a poet. Apollo had there a temple. There alſo was the fountain Caſtalia, into which Apollo had metamorphoſed a nymph that he loved, and had given to its waters the power of making all who drank of them poets. At the foot of Parnaſſus flowed the river Hippocrene, that had the ſame virtue; and the ſource of which was opened by a ſtroke of the foot of the horſe Pegaſus. This river nouriſhed a great number of ſwans, that were regarded as ſacred. Pegaſus was a winged horſe, that belonged to Apollo, and grazed on the ſummit of Parnaſſus. He ſprang from the blood of Meduſa, when Perſeus cut off her head, which was placed among the ſtars. Such was the delicious abode of Apollo, the ſon of Jupiter and Latona, who was born, with his twin ſiſter Diana, in the iſland Delos. He killed the Cyclops, who forged the thunderbolts with which Jupiter had overthrown his ſon Æſculapius; but for that preſumption, he was forced to leave heaven, and become an inhabitant of the earth. He guarded the oxen of Admetus; he aided Neptune to build the walls of Troy, and Alcotheus in forming the labyrinth. He killed the dragon or ſerpent Python. He invented Muſick and phyſick; and was honoured as the god of poets and phyſicians. He was repreſented as a young man without a beard, his head ſurrounded with rays, and bearing in his hand a bow, or a lyre. As the ancients denoted the ſun by the name of Apollo, they ſometimes repreſented him alſo as ſeated in a chariot, drawn by two white horſes, preceded by Aurora and the ſtar Venus: Phaeton his ſon, being deſirous of conducting theſe horſes, was thrown into the ſea. Apollo was alſo called Phœbus, Titan, and Sol. He is known to have had amours with Arſinoe, Corycia, Melœne, Cyrene, Mantho, Sinope, Calliope, and others; by whom he had Delphe, Naxe, Miletus, Arabe, Garamas, Sirus, Linus, Orpheus, and other children. He had peculiar honours paid him in the Pythian games at Delphos, and in the ſecular games at Rome.

The Muſes were the companions of Apollo in his rural abode. They were likewiſe called the learned ſiſters; as alſo the Camœnion, Heliconian, Parnaſſian, Aonian, Pierian, Pegaſian, Aganippian, Theſpian, Libethrian, and Caſtalian ſiſters. They were the daughters of Jupiter and Mnemoſyne, and were regarded as the goddeſſes of ſciences and arts in general. There were nine of theſe muſes; to whom they attributed, 1. to Clio, hiſtory, 2. to Melpomene, tragedy, 3. to Thalia, comedy, 4. to Euterpe, flutes and other pneumatic inſtruments of muſick, 5. to Terpſichore, the harp and the dance, 6. to Erato, the lyre and the lute, 7. to Calliope, heroic verſe, 8. to Urania, aſtronomy, and 9. to Polyhymnia, rhetoric and eloquence. The Graces alſo ſometimes quitted Venus to pay their court to Apollo.

Such was the idea they entertained of Parnaſſus and its inhabitants. There is no doubt but that, under theſe fabulous repreſentations, theſe ſenſible images, were concealed allegoric and moral meanings; nor can it be denied but that their method of cultivating the arts and ſciences, by this manner of expreſſing their ideas, was as ingenious and pleaſing as it is poſſible to imagine. Every other ſubject that paganiſm embraced, it treated with the ſame genius, and in a manner equally pleaſing; and though that religion was altogether fallacious, yet we muſt allow that it was extremely well calculated to promote the polite arts, by thoſe refined, noble, graceful, brilliant images, by thoſe charming ſubjects, which it conſtantly preſented, and which it ſtill offers to the poet, painter, ſculptor, and every other artiſt.

But this was not a power ſufficiently ſtrong to ſecure paganiſm againſt that viciſſitude, that decline and diſſolution, which finally attends all the productions of this world. This religion, which had ſubſiſted near five thouſand years, and almoſt from the origin of the human race, gradually declined in proportion as the lights of Chriſtianity and philoſophy illumined the minds of mankind. For though the pagan religion, and the fables on which it was founded, were pleaſing and favourable to the polite arts, they were not however calculated to ſatisfy the minds of philoſophers, nor to promote the real good of mankind, by ſecuring their temporal and eternal happineſs. It is even ſurpriſing that ſo great a genius as the emperor Julian ſhould attempt to revive the embers of paganiſm, which inſenſibly declined, and had received a mortal blow at the beginning of the fourth century by the emperor Conſtantine the great. Julian employed all the reſources of his imagination, of his eloquence, of his power, and even of his own fatal example, to revive it; but in vain. The fatal period of paganiſm was arrived, and nothing could ſave it from deſtruction. The furious Theodoſius, to whom bigotted prieſts and hiſtorians have aſſigned the name of Great, totally overthrew it toward the cloſe of the ſame century, deſtroyed thoſe temples and altars which yet ſubſiſted, diſperſed its colleges, and exterminated its prieſts. From that dire epoch, nothing of paganiſm has remained, except ſome ruins diſperſed in the remote parts of the earth, and among people wretched and almoſt unknown; where this religion, once ſo flouriſhing and univerſal, is now degenerated into groſs and diſguſtful idolatry.

MYURUS, in medicine, an epithet for a ſort of ſinking pulſe, when the ſecond ſtroke is leſs than the firſt, the third than the ſecond, and ſo on.

N.

N.

NABOB, a viceroy or governor of one of the provinces of the Mogul's empire, in India.

NABONASSAR, or *Æra of* NABONASSAR. See ASTRONOMY, p. 493.

NADIR, in aſtronomy, that point of the heavens which is diametrically oppoſite to the zenith, or point directly over our heads. See ASTRONOMY, p. 435.

NÆVI, in ſurgery, marks or excreſcences made on the ſkin of an infant before its birth, vulgarly ſuppoſed to be occaſioned by the imagination of the mother.

NAHUM, or *the prophecy of* NAHUM, a canonical book of the Old Teſtament.

Nahum, the ſeventh of the twelve leſſer prophets, was a native of Elkoſhai, a little village of Galilee. The ſubject of his prophecy is the deſtruction of Nineveh, which he deſcribes in the moſt lively and pathetic manner; his ſtyle is bold and figurative, and cannot be exceeded by the moſt perfect maſters of oratory. This prophecy was verified at the ſiege of that city by Aſtyages, in the year of the world 3378, 622 years before Chriſt.

NAIADS, in mythology, the nymphs of the fountains. See MYTHOLOGY.

NAIANT, in heraldry, a term uſed in blazoning fiſhes, when borne in an horizontal poſture, as if ſwimming.

NAJAS, in botany, a genus of the monœcia monandria claſs. The calix of the male is cylindrical and bifid; the corolla conſiſts of four ſegments; and there are no filaments: The female has neither calix nor corolla, but one piſtil and an ovated capſule. There is only one ſpecies, *viz.* the marina, found in the European ſeas.

NAIL, *unguis*, in anatomy. See ANATOMY, p. 256.

NAILS, in building, *&c.* ſmall ſpikes of iron, braſs, *&c.* which being drove into wood, ſerve to bind ſeveral pieces together, or to faſten ſomething upon them.

NAIL, is alſo a meaſure of length, containing the ſixteenth part of a yard.

NAIRN, a borough and port town of Scotland, eighteen miles eaſt of the town of Inverneſs.

NAISSANT, in heraldry, is applied to any animal iſſuing out of the midſt of ſome ordinary, and ſhewing only his head, ſhoulders, forefeet and legs, with the tip of his tail; the reſt of his body being hid in the ſhield, or ſome charge upon it; in which it differs from iſſuant, which denotes a living creature ariſing out of the bottom of any ordinary or charge.

NAKED SEEDS, in botany, are thoſe that are not incloſed in any pod or caſe.

NAMA, in botany, a genus of the pentandria digynia claſs. The calix conſiſts of five leaves, and the corolla of five ſegments; and the capſule has one cell and two valves. There are two ſpecies, none of them natives of Britain.

NAME, denotes a word whereby men have agreed to expreſs ſome idea; or which ſerves to ſignify a thing or ſubject ſpoken of. See GRAMMAR.

NAMUR, a ſtrong city of the Auſtrian Netherlands, capital of the province of Namur, ſituated at the confluence of the Sambre and Maeſe: E. long. 4° 50′, N. lat. 50° 30′.

NANCY, the capital of Lorrain in Germany, ſituated in E. long. 6°, N. lat. 48° 44′.

NANFIO, one of the iſlands in the Archipelago, ſixteen miles round, and ſituated in E. long. 26°, N. lat. 35°.

NANKING, the capital of the province of Nanking, and formerly of the Empire of China, is ſituated in E. long. 118° 30′, N. lat. 32°.

NANSAMUND, a county of Virginia, in North America, ſouth of the Iſle-of-Wight county, through which the river of Nanſamund runs.

NANTZ, a city of France in the province of Brittany, ſituated on the river Loire, in W. long. 1° 30′, N. lat. 47° 15.

NANTWICH, a market town of Cheſhire, ſituated ſeventeen miles ſouth-weſt of Cheſter.

NAPÆA, in botany, a genus of the monadelphia polyandria claſs. The calix is ſimple and cylindrical; and the capſule contains one ſeed. There are two ſpecies, none of them natives of Britain.

NAPHTHA, in natural hiſtory, a fluid mineral body, of a thin conſiſtence, bright and pellucid, of a ſtrong ſmell, very readily inflammable, and, when pure, burning away without leaving any reſiduum.

The naphtha is found in conſiderable quantities floating on the water of certain ſprings, principally breaking out at the ſides of hills in Perſia, Tartary, and ſome parts of the empire of China; where if a lighted candle be held near the ſurface, it takes fire and overſpreads the ſurface of the water for a great extent, with a ſtrong white flame, and emits a very diſagreeable ſmell. The genuine naphtha is very rare in Europe; it is not known to be any where naturally produced here, and what we ſee of it is generally ſophiſticated. Diſtilled by the retort, it yields an oil ſomewhat thinner than it was originally, and of a weaker ſmell. The ſubſtance remaining at the bottom of the retort, has much the reſemblance of amber; and Dr Hill thinks it highly probable, that the origin of all the amber is from the ſame ſort of principle; nay, he tells us that he has ſucceeded

ceeded ſo far in an attempt to make amber by this fluid and an acid drawn from the crude pyrites, that he has produced a friable ſomewhat pellucid matter, having all the properties of amber except its hardneſs and clearneſs, and yielding a true ſalt and oil of amber on diſtillation.

The medicinal virtues of the naptha are the ſame with the common petroleum, but in a more remiſs degree. It is uſed externally on many occaſions in Perſia; and is taken inwardly, a few drops for a doſe, in colics. The principal uſe made of it, however, is burning in lamps, for which purpoſe it is very proper.

MAPIER's, or NEPER's BONES. See NEPER.

NAPLES, the capital of the kingdom of Naples: ſituated in E. long. 15°, N. lat. 41°.

The kingdom of Naples is one of the Sicilies; it is the ſouth-eaſt part of Italy, and is ſituated between 14° and 19° E. long. and between 38 and 34° N. lat. being bounded by the gulph of Venice on the north-eaſt, by the Mediterranean ſea on the ſouth-eaſt, by Sicily and the Tuſcan ſea on the ſouth-weſt, and by the Pope's territories on the north-weſt; and divided from the iſlands of Sicily only by the narrow ſtraight of Pharo or Meſſina.

NARBARTH, a town of Pembrokeſhire, in ſouth Wales, ſituated ten miles north eaſt of Pembroke.

NARBONNE, a city of France, in the province of Languedoc: ſituated in E. long. 2° 40′, N. lat. 43° 18′.

NARBOROUGH, an iſland of South-America, in the Pacific Ocean, ſituated on the coaſt of Chili, in W. long. 85°, S. lat. 45′.

NARCISSUS, the DAFFODIL, in botany, a genus of the hexandria monogynia claſs. The corolla conſiſts of ſix leaves, and the nectarium of one entire funnel-ſhaped leaf; and the ſtamina are ſituate within the nectarium. There are 13 ſpecies, only two of which are natives of Britain, *viz.* the poeticus, common pale daffodil, or primroſe peerleſs; and the pſeudo-narciſſus, or wild Engliſh daffodil.

NARCOTICS, in medicine, ſoporiferous medicines, which excite a ſtupefaction.

Narcotics, called alſo hypnotics, anodynes, or ſtupefactives, are ſaid, by Hoffman, to be ſuch kind of remedies as, by their ſubtle, noxious, and deleterious exhalations, diminiſh, or quite deſtroy, the ſenſe and motion of the ſolid parts. Among narcotics, the moſt eminent are thoſe which are uſually prepared for medicinal uſes of the whole poppy, eſpecially opium; as alſo all thoſe prepared of mandragoras, hyoſcyamus, ſtramonium, and datura.

NARDO, a port town of Italy, in the kingdom of Naples: E. long. 19°, N. lat. 40° 33′.

NARDUS, in botany, a genus of the triandria monogynia claſs. It has no calix, and the corolla conſiſts of two valves. There are five ſpecies, only one of which, *viz.* the ſtricta, or malt-graſs is a native of Britain.

NARRATION, in oratory and hiſtory, a recital or rehearſal of a fact as it happened, or when it is ſuppoſed to have happened. See DESCRIPTION.

NARWAL, in ichthyology. See MONODON.

NARVAR, a city of the hither India, the capital of the province of Narvar: E. long. 79°, N. lat. 2[illegible].

NASIAS, in anatomy, a thin bone, making the upper part of the noſe. See ANATOMY, p. 1[illegible].

NASSAU, the capital of the county of the ſame name in Germany: E. long. 7° 25′, N. lat. 50° 21′.

NASSUS, in ichthyology. See CYPRINUS.

NATES, in anatomy, a term expreſſing thoſe two fleſhy exterior parts of the body vulgarly called the buttocks.

NATES CEREBRI. See ANATOMY, p. 286.

NATION, a collective term, uſed for a conſiderable number of people inhabiting a certain extent of land, confined within fixed limits, and under the ſame government.

NATIVE, a perſon conſidered as born in a certain place which was the proper reſidence of his parents, and where he received his education.

NATIVITY, or NATAL DAY, the day of a perſon's birth: The word nativity is chiefly uſed in ſpeaking of the ſains, as the nativity of St. John the Baptiſt, *&c.* But when we ſay the Nativity, it is underſtood of that of Jeſus Chriſt, or the feaſt of Chriſtmas.

NATOLIA, the modern name of the Leſſer Aſia, being the moſt weſterly part of Turkey in Aſia, and conſiſting of a large peninſula, which extends from the river Euphrates, as far as the Archipelago, the ſeas of Marmora, the ſtraits of Galipoli and of Conſtantinople, which ſeparate it from Europe on the weſt. It is bounded on the north by the Black-Sea, and on the ſouth by the Mediterranean ſea.

NATRIX, in zoology. See COLUBER.

NATRUM, the nitre of the ancients, in natural hiſtory, is a genuine, pure and native ſalt, extremely different from our nitre, and indeed from all the other native ſalts; it being a fixed alkali, plainly of the nature of thoſe made by fire from vegetables, yet capable of a regular cryſtallization, which thoſe ſalts are not. It is found on the ſurface of the earth, or at very ſmall depths within it; and is naturally formed into thin and flat cakes or cruſts, which are of a ſpungy or cavernous ſubſtance, very light and friable, and, when pure, of a pale browniſh-white; but as its ſpungy texture renders it very ſubject to be fouled by earth received into its pores, it is often met with of a deep dirty brown, and not unfrequently reddiſh.

Natrum, whether native or purified, diſſolves in a very ſmall quantity of water; and this ſolution is, in many parts of Aſia, uſed for waſhing; where it is alſo made into ſoap, by mixing it with oil. Natrum reduced to powder, and mixed with ſand or flints, or with any other ſtone of which cryſtal is the baſis, make them readily run into glaſs, Gold heated red hot, and ſprinkled with a ſmall quantity of this ſalt, melts immediately; ſilver ignited and ſprinkled with it, melts in the ſame manner; as does alſo iron, copper, and the regulus of antimony, which melt much more eaſily than they otherwiſe would do. Mercury will not be mixed with it by any art, and indeed will not amalgamate with metals if only a little of this ſalt be added. It is found in great abundance in many parts of Aſia, where the natives ſweep it

it up from the ſurface of the ground, and call it ſoap-earth. The earlieſt account we have of it is in the Scriptures, where we find that the ſalt called nitre in thoſe times would ferment with vinegar, and had an abſterſive quality, ſo that it was uſed in baths and in waſhing things. Solomon compares the ſinging of ſongs with a heavy heart, to the contrariety of vinegar and nitre; and Jeremiah ſays, that if the ſinner waſh himſelf with nitre, his ſin is not cleanſed off. Theſe are properties that perfectly agree with this ſalt, but not at all with our ſalt petre.

NATURAL HISTORY.

NATURAL HISTORY, is that ſcience which not only gives compleat deſcriptions of natural productions in general, but alſo teaches the method of arranging them into Claſſes, Orders, Genera, and Species. This definition includes Zoology, Botany, Mineralogy, *&c.* But, in a work of this kind, we thought it would be eaſier, and more advantageous to the reader, to treat theſe branches of natural hiſtory ſeparately under their reſpective names. See BOTANY, *&c.* Under the title of NATURAL HISTORY, therefore, we ſhall confine ourſelves to ZOOLOGY, or that part of it which relates to *Animals*. It is likewiſe neceſſary to mention in this place, that we have given the deſcriptions and characters of animals under their proper names. The ſcientific part of the ſubject, therefore, or the method of inveſtigating the genera or ſpecies of animals, by means of natural or artificial arrangement, only remains to be explained.

In order to abridge the ſtudy of zoology, many methods of reducing animals to claſſes, genera, and ſpecies, have been invented. But, as that of Linnæus is undoubtedly the beſt, the moſt extenſive, and the leaſt underſtood, we ſhall give a brief account of it.

Linnæus divides the whole animal kingdom into 6 claſſes. The characters of theſe 6 claſſes are taken from the internal ſtructure of animals, in the following manner.

CLASS I. MAMMALIA, includes all animals that ſuckle their young. The characters of this claſs are theſe:—The heart has two ventricles and two auricles; the blood is red and warm; and the animals belonging to it are *viviparous*.

CLASS II. AVES, or BIRDS.—The characters are the ſame with thoſe of Claſs I. excepting that the animals belonging to it are *oviparous*.

CLASS III. AMPHIBIA, or AMPHIBIOUS ANIMALS.—The *heart* has but one ventricle and one auricle; the *blood* is red and cold; and the animals belonging to this claſs have the command of their *lungs*, ſo that the intervals between *inſpiration* and *expiration* are in ſome meaſure *voluntary*.

CLASS IV. PISCES, or FISHES.—The *heart* has the ſame ſtructure, and the *blood* the ſame qualities with thoſe of the *Amphibia*; but the animals belonging to this claſs are eaſily diſtinguiſhed from the Amphibia, by having no ſuch voluntary command of their *lungs*, and by having external *branchiæ* or *gills*.

CLASS V. INSECTA, or INSECTS.—The *heart* has *one ventricle*, but no *auricle*; the *blood* is cold and white; and the animals are furniſhed with *antennæ*, or *feelers*.

CLASS VI. VERMES, or WORMS.—The characters are the ſame with thoſe of Claſs V. only the animals have no antennæ, and are furniſhed with *tentacula*.

The *Firſt Claſs*, MAMMALIA, is ſubdivided into 7 ORDERS; the characters of which are taken from the number, ſtructure, and ſituation of the TEETH.

ORDER I. The PRIMATES, have 4 inciſores, or *fore-teeth*, in each jaw, and one *dog-tooth*. N. B. By *one* dog-tooth, Linnæus means one on each ſide of the fore-teeth in both jaws.—This order includes 4 genera, *viz.* Homo, Simia, Lemur, Veſpertilio. See theſe articles.

ORDER II. The BRUTA, have no *fore-teeth* in either jaw.—This order includes 6 genera, *viz.* Elephas, Trichechus, Bradypus, Myrmecophaga, Manis, Daſypus. See theſe articles.

ORDER III. The FERÆ, have, for the moſt part, 6 *conical fore-teeth* in each jaw.—This order includes 10 genera, *viz.* Phoca, Canis, Felis, Viverra, Muſtela, Urſus, Didelphis, Talpa, Sorex, Erinaceus. See theſe articles.

ORDER IV. The GLIRES, have 2 fore-teeth in each jaw, and no *dog-teeth*.—This order includes 6 genera, *viz.* Hyſtrix, Lepus, Caſtor, Mus, Sciurus, Noctilio. See theſe articles.

ORDER V. The PECORA, have no *fore teeth* in the upper jaw, but 6 or 8 in the under-jaw.—This order includes 6 genera, *viz.* Camelus, Moſchus, Cervus, Capra, Ovis, Bos. See theſe articles.

ORDER VI. The BELLUÆ, have *obtuſe fore-teeth* in each jaw.—This order includes 4 genera, *viz.* Equus, Hippopotamus, Sus, Rhinoceros. See theſe articles.

ORDER VII. The CETE, or *whale kind*, have no uniform character in their teeth, being very different in the different genera; but are ſufficiently diſtinguiſhed from the other orders of Mammalia, by living in the ocean, having pectoral fins, and a fiſtula or ſpiraculum upon the head.—This order includes 4 genera, *viz.* Monodon, Balæna, Phyſeter, Delphinus. See theſe articles.

The *generic* characters of the Mammalia are, like thoſe of the orders, almoſt entirely taken from the TEETH,

excepting

excepting the Vespertilio, which, besides the character of the order derived from the teeth, has this further mark, that there is a membrane attached to the feet and sides, by means of which the creature is enabled to fly;—the Hystrix, whose body is covered with sharp spines;—and the whole order of Pecora, whose genera, besides the characters taken from the teeth, are distinguished into those which have *horns*, those which have *no horns*, and by peculiarities in the horns themselves.

The *specific* characters are very various, being taken from any part of the body which possesses a peculiar uniform mark of distinction. As examples of these characters are to be found under the proper name of each genus, it is unnecessary to say any thing further concerning them in this place.

The *Second Class*, AVES, is subdivided into six ORDERS, the characters of which are taken chiefly from the structure of the BILL.

ORDER I. The ACCIPITRES, have a HOOKED BILL, the superior mandible, near the base, being extended on each side beyond the inferior; and in some, the superior mandible is armed with *teeth*.—This order includes 4 species, *viz.* Vultur, Falco, Strix, Lanius. See these articles.

ORDER II. The PICÆ, have a convex, compressed BILL, resembling a knife.—This order contains 22 genera, *viz.* Buphaga, Certhia, Corvus, Cuculus, *&c.* See these articles.

ORDER III. The ANSERES, have an obtuse BILL, gibbous at the base, broadest at the point, covered with a smooth skin, and furnished with teeth: The *tongue* is fleshy; and the toes are palmated, or webbed.—This order includes 12 genera, *viz.* Alca, Anas, Colymbus, Diomedia, *&c.* See these articles.

ORDER IV. The GRALLÆ, have a long, obtuse, and somewhat cylindrical BILL: The *tongue* is undivided, and fleshy; and the *thighs* are naked. This order contains 18 genera, *viz.* Ardea, Fulica, Tringa, Charadrius, *&c.* See these articles.

ORDER V. The GALLINÆ, have a convex BILL; the superior mandible is vaulted over the inferior, and the margin of the superior mandible folds over the inferior one: The *nostrils* are half covered with a convex cartilaginous membrane: The *rectrices*, or principal quill-feathers of the tail, are always more than twelve in number; and the *feet* are divided, but connected at the inmost joint. —This order contains 7 genera, *viz.* Didus, Phasianus, Meleagris, Pavo, *&c.* See these articles.

ORDER VI. The PASSERES, have a conical sharp-pointed BILL; and the *nostrils* are oval, wide, and naked.—This order contains 15 genera, *viz.* Caprimulgus, Alauda, Columba, *&c.* See these articles.

The *generic* characters of this class are taken from peculiarities in the *bill*, the *nostrils*, the *tongue*, the *feet*, the *feathers*, the *face*, the *figure* of the *body*, &c

The characters which serve to distinguish the *species* are very various: For example, the *colour* of particular *feathers* or parts of *feathers*; *crests* of feathers on the head, disposed in different manners; the colour of the *cere* or *wax*; the colour of the *feet*; the shape and length of the *tail*; the number, situation, *&c.* of the *toes*; the colour and figure of the *bill*; &c.

The *Third Class*, AMPHIBIA, is divided into four ORDERS.

ORDER I. The REPTILES, have *legs*, and breathe by the *mouth*.—This order contains 4 genera, *viz.* Testudo, Draco, Lacerta, Rana. See these articles.

ORDER II. The SERPENTES, have no *legs*, and breathe by the *mouth*.—This order contains 6 genera, *viz.* Crotalus, Boa, Coluber, Anguis, Amphisbæna, Cœcilia. See these articles.

ORDER III. The NANTES, are furnished with *lungs*, and at the same time breathe by lateral *gills*; and the rays of their fins are cartilaginous. —This order contains 14 genera, *viz.* Accipenser, Balistes, *&c.* See these articles.

ORDER IV. The MEANTES, have both *lungs* and *gills*; and the *feet* are furnished with *toes* and *claws*.—This order contains but one genus, *viz.* the Siren. See SIREN.

The *generic* characters of this class are taken from the general figure of the *body*; from their having *tails* or *no tails*; being covered with a *shell*; having *teeth* or *no teeth* in the *mouth*; being furnished with *wings*; having *cover'd* or *naked* bodies; from the number, situation, and figure of the *scuta* and *scales*; from the number and situation of the *spiracula*; from the situation of the *mouth*, &c.

The *specific* characters are so very various, that it would be superfluous to enumerate them.

The *Fourth Class*, PISCES, is subdivided into four ORDERS, the characters of which are taken from the situation of the *belly-fins*.

ORDER I. The APODES, have no *belly-fins*.—This order contains 8 genera, *viz.* Ammodytes, Anarrhicas, Muræna, *&c.* See these articles.

ORDER II. The JUGULARES, have the *belly-fins* placed before the *pectoral fins*.—This order includes 5 genera, *viz.* Callionymus, Blennius, Gadus, *&c.* See these articles.

ORDER III. The THORACICI, have the *belly-fins* placed *under* the *pectoral fins*.—This order comprehends 17 genera, *viz.* Gabius, Labrus, Sparus, *&c.* See these articcles.

ORDER IV. The ABDOMINALES, have the *belly-fins* placed *behind* the *pectoral fins*. This order contains 17 genera, *viz.* Fistularia, Esox, Clupea, Cyprinus, *&c.* See these articles.

The *generic* characters of this class are taken from peculiarities in the *head*, the *mouth*, the *teeth*, the *nostrils*, the *rays* in the *membrane of the gills*, the *eyes*, the general *figure* of the *body*, the figure of the *tail*, the situation of the *spiracula*, &c.

The *specific* characters are taken from peculiarities in all the parts above enumerated, and many others.

The *Fifth Class*, INSECTA, is subdivided into 7 ORDERS, the characters of which are taken from the wings.

ORDER I. The COLEOPTERA, have *four wings*, the two superior ones being crustaceous, and furnished with a *straight suture*.—This order comprehends 40 genera, *viz.* Attelabus, Scorabæus, Coccinella, Melœ, *&c.* See these articles.

ORDER II. The HEMIPTERA, have *four wings*, the two superior ones being *semicrustaceous*, and *incumbent*, i. e. the *interior edges* lie above one another.—This order includes 12 genera, *viz.* Blatta, Gryllus, Cicada, *&c.* See these articles.

ORDER III. The LEPIDOPTERA, have *four wings*, all of them imbricated with *scales*.—This order contains 3 genera, *viz.* Papilio, Sphinx, Phalæna. See these articles.

ORDER IV. The NEUROPTERA, have *four wings* interwoven with veins, like a piece of *network*, and no *sting* in the *anus*.—This order includes 7 genera, *viz.* Libella, Ephemera, Hemerobius, *&c.* See these articles.

ORDER V. The HYMENOPTERA, have the same characters with the former, only the *anus* is armed with *a sting*. But this mark is peculiar to the *females* and *neuters*; for the *males* have no *sting*.—This order comprehends 10 genera, *viz.* Apis, Formica, Vespa, *&c.* See these articles.

ORDER VI. The DIPTERA have *two wings*, and two *clavated halteres* or *balances* behind each wing.—This order contains 10 genera, *viz.* Combylius, Asilus, Tipala, *&c.* See these articles.

ORDER VII. The APTERA, have *no wings*. This order contains 14 species, *viz.* Acarus, Aranea, Pediculus, *&c.* See these articles.

The *Sixth Class*, VERMES, is divided into five ORDERS.

ORDER I. The INTESTINA, are the most *simple animals*, being perfectly *naked*, and without *limbs* of any kind.—This order contains 7 genera, *viz.* Lumbricus, Spinunculus, Fasciola, Gordius, Ascaris, Hirudo, Mycine. See these articles.

ORDER II. The MOLLUSCA, are likewise *simple naked animals*, without any *shell*; but they are *brachiated*, or furnished with a kind of *limbs*.—This order comprehends 18 genera, *viz.* Ascidia, Limare, Doris, Tethys, Aphrodita, Sepia, *viz.* See these articles.

ORDER III. The TESTACEA, have the same characters with those of Order II. but are covered with a *shell*.—This order includes 39 genera, *viz.* Anomia, Cardium, Argonauta, Bulla, Buccinum, *&c.*

ORDER IV. The LITHOPHYTA, are *compound animals*, fixed upon a *calcareous base* constructed by the creatures *themselves*.—This order includes the corals, of which there are 4 genera, *viz.* Tubipora, Madrepora, *&c.* See these articles.

ORDER V. The ZOOPHYTA, are *compound animals*, furnished with a kind of *flowers*, and having a vegetating *root* and *stem*.—This order contains 15 genera, *viz.* Spongia, Gorgonia, Tubularia, Hydra, *&c.* See these articles.

This short explanation will enable any person who understands the Latin language to peruse the Systema Naturæ of Linnæus without the assistance of a master; which was the principal object of this article.

NATURAL PHILOSOPHY, that which considers the powers and properties of natural bodies, and their mutual actions on one another. See MECHANICS, OPTICS, ASTRONOMY, HYDROSTATICS, PNEUMATICS.

NATURALIZATION. See LAW, Tit. x, 6.

NATURALS, among physicians, whatever naturally belongs to an animal, in opposition to non-naturals. See NON-NATURALS.

NATURE, according to Mr. Boyle, has eight different significations; it being used, 1. For the Author of nature, whom the schoolmen call *Natura Naturans*, being the same with God. 2. By the nature of a thing, we sometimes mean its essence; that is, the attributes which make it what it is, whether the thing be corporeal or not; as when we attempt to define the nature of a fluid, of a triangle, *&c.* 3. Sometimes we confound that which a man has by nature, with what accrues to him by birth; as when we say, that such a man is noble by nature. 4. Sometimes we take nature for an internal principle of motion; as when we say, that a stone by nature falls to the earth. 5. Sometimes we understand, by nature, the established course of things. 6. Sometimes we take nature for an aggregate of powers belonging to a body, especially a living one; in which sense physicians say, that nature is strong, weak, or spent; or that, in such or such diseases, nature left to herself will perform the cure. 7. Sometimes we use the term nature for the universe, or whole system of the corporeal works of God; as when it is said of a phœnix, or chimera, that there is no such thing in nature. 8. Sometimes too, and that most commonly, we express by the word nature a kind of semi-deity, or other strange kind of being.

If, says the same philosopher, I were to propose a notion of nature, less ambiguous than those already mentioned, and with regard to which many axioms relating to that word may be conveniently understood, I should first distinguish between the universal and the particular nature of things. Universal nature I would define to be the aggregate of the bodies that make up the world, in its present state, considered as a principle; by virtue whereof they act and suffer, according to the laws of motion prescribed by the Author of all things. And this makes way for the other subordinate notion; since the particular nature of an individual consists in the general nature applied to a distinct portion of the universal

universe; or, which is the same thing, it is a particular assemblage of the mechanical properties of matter, as figure, motion, *&c.*

NAVARINO, a port-town of European Turkey in the Morea, ninety-miles south-west of Corinth.

NAVARRE, a province of Spain, bounded by French Navarre on the north-east, by Arragon on the south-east, by Old Castile on the south-west, and by Guipuscoa on the west: it is a mountanious country.

French Navarre, separated from Spanish Navarre on the south-west by the Pyrenees: it is only thirty miles long, and fifteen broad; being one of the most barren provinces in France.

NAVE, in architecture, the body of a church where the people are disposed, reaching from the balluster, or rail of the choir, to the chief door.

NAVEL, in anatomy, the centre of the lower part of the abdomen; being that part where the umbilical vessels passed out of the foetus to the placenta of the mother. See MIDWIFERY.

NAVEL-WORT, in botany. See COTYLEDON.

NAVEREINI, a town of Gascony, in France, sixteen miles south-east of Bayonne.

NAVEW, in botany. See BRASSICA, of which it is a species.

NAVICULARE os, in anatomy. See ANAT. p. 186.

NAVIDAD, a port-town of Mexico, in the province of Mechoachan: W. long. 110°, and N. lat. 19°.

NAVIGATION.

NAVIGATION, is the art of conducting or carrying a ship from one port to another. In order to understand this science, particularly the theoretical parts of it, it is necessary that the student be acquainted with the general principles of GEOMETRY, ASTRONOMY, and TRIGONOMETRY. See these articles.

Sect. I. *Of the* LOG-LINE *and* COMPASS.

1. THE method commonly made use of for measuring a ship's way at sea, or how far she runs in a given space of time, is by the log-line, and half-minute glass.

2. The log is a flat piece of wood, in shape like a flounder, having a piece of lead fastened to its bottom, which makes it stand or swim upright in the water: to this log is tied or fastened a long line, which is called the log-line; and this is commonly divided into certain spaces, each of which is, or ought to be, such a proportional part of a nautical mile (60 of which make a degree of a great circle on the earth) as half a minute (the time allowed for the experiment) is of an hour.

3. These spaces are called knots, because at the end of each of them there is a piece of twine with knots in it, inreeved between the strands of the line, which shews how many of these spaces or knots are run out during the half minute. They commonly begin to be counted at the distance of about 10 fathom or 60 feet from the log; that so the log, when it is hove over board, may be out of the eddy of the ship's wake before they begin to count; and for the more ready discovery of this point of commencement, there is commonly fastened at it a piece of red rag.

4 The log being thus prepared, and hove over board from the poop, and the line veered out (by the help of a reel, that turns easily, and about which it is wound) as fast as the log will carry it away, or rather as the ship sails from it, will shew, according to the time of veering, how far the ship has run in a given time, and consequently her rate of sailing.

5. A degree of a meridian, according to the exactest measures, contains about 69.545 English miles; and each mile by the statute being 5280 feet, therefore a degree of a meridian will be about 367200 feet; whence the $\frac{1}{60}$ of that, *viz.* a minute, or nautical mile, must contain 6120 standard feet; consequently, since $\frac{1}{2}$ minute is the $\frac{1}{120}$ part of an hour, and each knot being the same part of a nautical mile, it follows, that each knot will contain the $\frac{1}{120}$ of 6120 feet, *viz.* 51 feet.

6. Hence it is evident, that whatever number of knots the ship runs in half a minute, the same number of miles she will run in one hour, supposing her to run with the same degree of velocity during that time; and therefore it is the general way to heave the log every hour to know her rate of sailing: but if the force or direction of the wind vary, and not continue the same during the whole hour; or if there has been more sail set, or any sail handed, that so the ship has run swifter or slower in any part of the hour than she did at the time of heaving the log; then there must be an allowance made accordingly for it, and this must be according to the discretion of the artist.

7. Sometimes when the ship is before the wind, and there is a great sea setting after her, it will bring home the log, and consequently the ship will sail faster than is given by the log. In this case it is usual, if there be a very great sea, to allow one mile in ten, and less in proportion, if the sea be not so great. But for the generality, the ship's way is really greater than that given by the log; and therefore, in order to have the reckoning rather before than behind the ship, (which is the safest way,) it will be proper to make the space on the log-line between knot and knot to consist of 50 feet instead of 51.

8. If the space between knot and knot on the log-line should happen to be too great in proportion to the half-minute glass, *viz.* greater than 50 feet, then the distance given by the log will be too short; and if that space be too small, then the distance run (given by the log) will be too great; therefore to find the true distance run in either case, having measured the distance between knot and knot, we have the following proportion, *viz.*

As the true distance, 50 feet, is to the measured distance; so are the miles of distance given by the log, to the true distance in miles that the ship has run.

EXAMPLE

EXAMPLE I. Suppose a ship runs at the rate of $6\frac{1}{4}$ knots in half a minute; but measuring the space between knot and knot, I find it to be 56 feet: Required the true distance in miles.

Making it, As 50 feet is to 56 feet, so is 6.25 knots to 7 knots; I find that the true rate of sailing is 7 miles in the hour.

EXAMPLE II. Suppose a ship runs at the rate of $6\frac{1}{2}$ knots in half a minute; but measuring the space between knot and knot, I find it to be only 44 feet: Required the true rate of sailing.

Making it, As 50 feet is to 44 feet, so is 6.5 knots to 5.72 knots; I find that the true rate or sailing is 5.72 miles in the hour.

9. Again, supposing the distance between knot and knot on the log-line to be exactly 50 feet, but that the glass is not 30 seconds; then, if the glass require longer time to run than 30 seconds, the distance given will be too great, if estimated by allowing 1 mile for every knot run in the time the glass runs; and, on the contrary, if the glass requires less time to run them 30 seconds, it will give the distance sailed too small. Consequently, to find the true distance in either case, we must measure the time the glass requires to run out (by the method in the following article;) then we have the following proportion, *viz.*

As the number of seconds the glass runs, is to half a minute, or 30 seconds; so is the distance given by the log, to the true distance.

EXAMPLE I. Suppose a ship runs at the rate of $7\frac{1}{2}$ knots in the time the glass runs; but measuring the glass, I find it runs 34 seconds: Required the true distance sailed.

Making it, As 34 seconds is to 30 seconds, so is 7.5 to 6.6; I find that the ship sails at the rate of 6.6 miles an hour.

EXAMPLE II. Suppose a ship runs at the rate of $6\frac{1}{2}$ knots; but measuring the glass, I find it runs only 25 seconds: Required the true rate of sailing.

Making it, As 25 seconds is to 30 seconds, so is 6.5 knots to 7.8 knots; I find that the true rate of sailing is 7.8 miles an hour.

10. In order to know how many seconds the glass runs, you may try it by a watch or clock, that vibrates seconds; but if neither of these be at hand, then take a line, and to the one end fastening a plummet, hang the other upon a nail or peg, so as the distance from the peg to the centre of the plummet be $39\frac{1}{5}$ inches: Then this put into motion will vibrate seconds; *i. e.* every time it passes the perpendicular, you are to count one second; consequently, by observing the number of vibrations that it makes during the time the glass is running, we know how many seconds the glass runs.

11. If there be an error both in the log line and half-minute glass, *viz.* if the distance between knot and knot and the log-line be either greater or less than 50 feet, and the glass runs either more or less than 30 seconds; then the finding out the ship's true distance will be somewhat more complicate, and admit of three cases, *viz.*

CASE I. If the glass runs more than 30 seconds, and the distance between knot and knot be less than 50 feet, then the distance give by the log-line, *viz.* by allowing 1 mile for each knot the ship sails while the glass is running, will always be greater than the true distance, since either of these errors give the distance too great. Consequently, to find the true rate of sailing in this case, we must first find (by Art. 8.) the distance, on the supposition that the log-line is only wrong, and then with this (by Art. 9.) we shall find the true distance.

EXAMPLE. Suppose a ship is found to run at the rate of 6 knots; but examining the glass, I find it runs 35 seconds; and measuring the log-line, I find the distance between knot and knot to be but 46 feet: Required the true distance run.

First, (by Art. 8.) We have the following proportion, *viz.* As 50 feet : 46 feet :: 6 knots : 5.52 knots. Then (by Art. 9.) As 35 seconds : 30 seconds :: 5.52 knots : 4.73 knots. Consequently the true rate of sailing is 4.73 miles an hour.

CASE II. If the glass be less than 30 seconds, and the place between knot and knot be more than 50 feet; then the distance given by the log will always be less than the true distance, since either of these errors lessen the true distance.

EXAMPLE. Suppose a ship is found to run at the rate of 7 knots; but examining the glass, I find it runs only 25 seconds; and measuring the space between knot an knot on the log line, I find it is 54 feet: Required the true rate of sailing.

First, (by Art. 9.) As 25 seconds : 30 seconds :: 7 knots : 8.4 knots. Then (by Art. 8.) As 50 feet : 54 feet :: 8.4 knots : 9.072 knots. Consequently the true rate of sailing is 9.072 miles an hour.

CASE III. If the glass runs more than 30 seconds, and the space between knot and knot be greater than 50 feet; or if the glass runs less than 30 seconds, and the space between knot and knot be less than 50 feet: then, since in either of these two cases the effects of the errors are contrary, it is plain the distance will sometimes be too great, and sometimes too little, according as the greater quantity of the error lies; as will be evident from the following examples.

EXAMPLE I. Suppose a ship is found to run at the rate of $9\frac{1}{2}$ knots per glass; but examining the glass, it is found to run 36 seconds; and by measuring the space between knot and knot, it is found to be 58 feet: Required the true rate of sailing.

First, (by Art. 8.) As 50 feet : 58 feet :: 9.5 knots : 11.02 knots. Then (by Art. 9.) As 38 seconds : 30 seconds :: 11.02 knots : 8.7 knots. Consequently the ship's true rate of sailing is 8.7 miles an hour.

EXAMPLE II. Suppose a ship runs at the rate of 6 knots per glass; but examining the glass, it is found to run only 20 seconds; and by measuring the log-line, the distance between knot and knot is found to be but 38 feet: Required the true rate of sailing.

First, (by Art. 8.) As 50 feet : 38 feet :: 6 knots : 4.56 knots. Then (by Art 9.) As 20 seconds : 30 seconds :: 4.56 knots : 6.84 knots. Consequently the true rate of sailing is 6.83 miles an hour.

But if in this case it happen, that the time the glass takes to run be to the distance between knot and knot, as 30, the seconds in half a minute, is to 50, the true distance

diſtance between knot and knot; then it is plain, that whatever number of ſeconds the glaſs conſiſts of, and whatever number of feet is contained between knot and knot; yet the diſtance given by the log-line, will be the true diſtance in miles.

12. Though the method of meaſuring the ſhip's way by the log-line, deſcribed in the foregoing articles, be that which is now commonly made uſe of; yet it is ſubject to ſeveral errors, and theſe very conſiderable. For firſt, the half-minute or quarter-minute-glaſſes (by which, and the log, the ſhip's way is determined) are ſeldom or never true, becauſe dry and wet weather have a great influence on them; ſo that at one time they may run more, and at another time fewer than 30 ſeconds, and it is evident that a ſmall error in the glaſs will cauſe a ſenſible one in the ſhip's way. Again, the chief property of the log is to have it ſwim upright, or perpendicular to the horizon: but this is too often wanting in logs, becauſe few ſeamen examine whether it is ſo or not, and generally take it upon truſt, being ſatisfied if it weigh a little more at the ſtern than the head: and from this there flows an error in the reckoning; for if the log does not ſwim upright, it will not hold water, nor remain ſteady in the place where it is heaved, ſince the leaſt check in the hand in veering the line will make it come up ſeveral feet: this repeated will make the errors become fathoms, and perhaps knots, which, how inſignificant ſoever they appear, are miles and parts of miles, and amount to a good deal in a long voyage. Another inconvenience attending the log-line is its ſtretching and ſhrinking; for when a new line is firſt uſed, let it be ever ſo well ſtretched upon the deck, and meaſured as true as poſſible, yet after wetting it ſhrinks conſiderably; and conſequently to be the better aſſured of the ſhip's way by the log-line, we ought to meaſure and alter the knots on it every time before we uſe it; but this is ſeldom done oftner than once a week, and ſometimes not above once or twice in a whole voyage; alſo when the line is meaſured to its greateſt degree of ſhrinking, it is generally left there; and when, by much uſe, it comes to ſtretch again, it is ſeldom or never mended, though it will ſtretch beyond what it firſt ſhrunk. Theſe, and many other errors, too well known, attending that method of meaſuring the ſhip's way by the log-line, plainly anſwers for a great many errors committed in reckonings. So it is to be wiſhed, that either this method were improved or amended, or that ſome other method leſs ſubject to error were found out.

13. The meridian and prime vertical of any place cuts the horizon in 4 points, at 90 degrees diſtance from one another, *viz.* *North*, *South*, *Eaſt*, and *Weſt*; that part of the *meridian* which extends itſelf from the place to the *north* point of the *horizon* is called the *north line;* that which tends to the *ſouth* point of the horizon, is called the *ſouth line;* and that part of the *prime vertical* which extends towards the right hand of the obſerver, when his face is turned to the *north*, is called the *eaſt line;* and laſtly, that part of the *prime vertical* which tends towards the left hand, is called the *weſt line;* the four points in which theſe lines meet the *horizon*, are called the *cardinal points*.

14. In order to determine the courſe of the winds, and to diſcover their various alterations or ſhiftings; each quadrant of the horizon intercepted between the meridian and prime vertical, is uſually divided into eight equal parts, and conſequently the whole horizon into thirty-two; and the lines drawn from the place on which the obſerver ſtandeth, to the points of diviſion in his horizon, are called rumb lines, the four principal of which are thoſe deſcribed in the preceding article, each of them having its name from the cardinal point in the horizon towards which it tends; the reſt of the rumb lines have their names comounded of the principal lines on each ſide of them, as in the figure; (*ſee Navigation Plates*, No. 1.) and over which-ſoever of theſe lines the courſe of the wind is directed, that wind takes its name accordingly.

15. The inſtrument commonly uſed at ſea for directing the ſhip's way, is called the mariner's compaſs; which conſiſts of a card and two boxes. The card is a circle made to repreſent the horizon, whoſe circumference is quartered and divided into degrees, and alſo into thirty-two equal parts, by lines drawn from the centre to the ſeveral points of diviſion, called points of the compaſs. On the back ſide of the card, and juſt below the ſouth and north line, is fixed a ſteel needle with a braſs cupola, or hollow center in the middle, which is placed upon the end of a fine pin, upon which the card may eaſily turn about; the needle is touched with a load-ſtone, by which a certain virtue is infuſed into it, that makes it (and conſequently the ſouth and north line on the card above it) hang nearly in the plane of the meridian, by which means the ſouth and north lines on the card produced would meet the horizon in the ſouth and north points; and conſequently all the other lines on the card produced would meet the horizon in the reſpective points.

16. The card is repreſented in No. 1. in which you may obſerve, that the capital letters N, S, E, W, denote the four cardinal points, *viz.* N the *North*, S the *South*, &c. and the ſmall letter *b* ſignifies the word *by*: the *Rhombs* in the middle between any two of the cardinals are expreſſed by the letters denoting theſe cardinals, that which denotes the point lying in the meridian having the precedence; thus the rhomb in the middle between the north and eaſt is expreſſed N E. which is to be read *North-Eaſt;* alſo S W denotes the *South-Weſt* rhomb, *&c.* the other rhombs are expreſſed according to their ſituation with reſpect to theſe middle rhombs, and the neareſt cardinals, as is plain from the foreſaid figure.

17. The card is put into a round box, made for it, having a pin erected in the middle, upon which the hollow centre of the needle is fixed, ſo as the card may lie horizontal, and eaſily vibrate according to the motion of the needle: the box is covered over with a ſmooth glaſs, and is hung in a braſs hoop upon two cylindrical pins, diametrically oppoſite to one another; and this hoop is hung within another braſs circle, upon two pins at right angles with the former. Theſe two circles, and the box, are placed in another ſquare wooden box, ſo that the innermoſt box, and conſequently the card, may keep horizontal which way ſoever the ſhip heels.

18. Since the meridians do all meet at the poles, and there

there form certain angles with one another; and ſince, if we move never ſo little towards the eaſt or weſt, from one place to another, we thereby change our meridian, and in every place the eaſt and weſt line being perpendicular to the meridian; it follows, that the eaſt and weſt line in the firſt place will not coincide with the eaſt and weſt line in the ſecond, but be inclined to it at a certain angle: and conſequently all the other rhomb lines at each place will be inclined to each other, they always forming the ſame angles with the meridian. Hence it follows, that all rhombs, except the four cardinals, muſt be curves or heliſpherical lines, always tending towards the pole, and approaching it by infinite gyrations or turnings, but never falling into it. Thus let P (No. 2.) be the pole, EQ an arch of the equator, PE PA, *&c.* meridians, and EFGHKL any rhomb: then becauſe the angles PEF, PFG, *&c.* are by the nature of the rumb line equal, it is evident that it will form a curve line on the ſurface of the globe, always approaching the pole P, but never falling into it; for if it were poſſible for it to fall into the pole, then it would follow, that the ſame line could cut an infinite number of other lines at equal angles, in the ſame point; which is abſurd.

19. Becauſe there are 32 rumbs (or points in the compaſs) equally diſtant from one another, therefore the angle contained between any two of them adjacent will be 11° 15′, *viz.* $\frac{1}{32}$ part of 360°; and ſo the angle contained between the meridian and the N*b*E, will be 11° 15′, and between the meridian and the NNE will be 22° 30′; and ſo of the reſt, as in the following table.

A Table of the Angles which every $\frac{1}{4}$ Point of the Compaſs makes with the Meridian.

North	South	Points	D. M.	North	South
		$\frac{1}{4}$	02 49		
		$\frac{1}{2}$	05 37		
		$\frac{3}{4}$	08 26		
N*b*E	S*b*E	1	11 15	N*b*W	S*b*W
		$1\frac{1}{4}$	14 04		
		$1\frac{1}{2}$	16 52		
		$1\frac{3}{4}$	19 41		
NNE	SSE	2	22 30	NNW	SSW
		$2\frac{1}{4}$	25 19		
		$2\frac{1}{2}$	28 07		
		$2\frac{3}{4}$	30 56		
NE*b*N	SE*b*S	3	33 45	NW*b*N	SW*b*S
		$3\frac{1}{4}$	36 34		
		$3\frac{1}{2}$	39 22		
		$3\frac{3}{4}$	42 11		
NE	SE	4	45 00	NW	SW
		$4\frac{1}{4}$	47 49		
		$4\frac{1}{2}$	50 37		
		$4\frac{3}{4}$	53 26		
NE*b*E	SE*b*E	5	56 15	NW*b*W	SW*b*W
		$5\frac{1}{4}$	59 04		
		$5\frac{1}{2}$	61 52		
		$5\frac{3}{4}$	64 41		
ENE	ESE	6	67 30	WNW	WSW
		$6\frac{1}{4}$	70 19		
		$6\frac{1}{2}$	73 07		
		$6\frac{3}{4}$	75 56		
E*b*N	E*b*S	7	78 45	W*b*N	W*b*S
		$7\frac{1}{4}$	81 34		
		$7\frac{1}{2}$	84 22		
		$7\frac{3}{4}$	87 11		
East		8	90 00	*West*	

Sect. 2. *Of* PLAIN SAILING.

1. THIS method of ſailing ſuppoſes the earth to be a plane, and the meridians parallel to one another; and likewiſe the parallels of latitude at equal diſtance from one another, as they really are upon the globe. Though this method be in itſelf evidently falſe; yet in a ſhort run, and eſpecially near the equator, an account of the ſhip's way may be kept by it tolerably well.

2. The angle formed by the meridian and rumb that a ſhip ſails upon, is called the ſhip's courſe. Thus if a ſhip ſails on the NNE rhomb, then her courſe will be 22° 30′, and ſo of others.

3. The diſtance between two places lying on the ſame parallel counted in miles of the equator, or the diſtance of one place from the meridian of another counted as above on the parallel paſſing over that place, is called meridional diſtance; which, in plain ſailing, goes under the name of departure.

4. Let A (N° 3.) denote a certain point on the earth's ſurface, AC it's meridian, and AD the parallel of latitude paſſing through it; and ſuppoſe a ſhip to ſail from A on the NNE rhomb till ſhe arrive at B; and through B draw the meridian BD, (which, according to the principles of plain ſailing, muſt be parallel to CA.) and the parallel of latitude BC; then the length of AB, *viz.* how far the ſhip has ſailed upon the NNE rhomb, is called her diſtance; AC or BD will be her difference of latitude, or northing; CB will be her departure, or eaſting; and the angle CAB will be the courſe. Hence it is plain, that the diſtance ſailed will always be greater than either the difference of latitude or departure; it being the hypothenuſe of a right-angled triangle, whereof the other two are the legs; except the ſhip ſails either on a meridian, or a parallel of latitude: for if the ſhip ſails on a meridian, then it is plain, that her diſtance will be juſt equal to her difference of latitude, and ſhe will have no departure; but if ſhe ſail on a parallel, then her diſtance will be the ſame with her departure, and ſhe will have no difference of latitude. It is evident alſo from the figure, that if the courſe be leſs than 4 points, or 45 degrees, its complement, *viz.* the other oblique angle, will be greater

greater than 45 degrees, and so the difference of latitude will be greater than the departure; but if the course be greater than 4 points, then the difference of latitude will be less than the departure; and lastly, if the course be just 4 points, the difference of latitude will be equal to the departure.

5. Since the distance, difference of latitude, and departure, form a right-angled triangle, in which the oblique angle opposite to the departure is the course, and the other its complement; therefore, having any two of these given, we can (by plain trigonometry) find the rest; and hence arise the cases of plain-sailing, which are as follow.

Case I. Course and distance given, to find difference of latitude and departure.

Example. Suppose a ship sails from the latitude of 30° 25′ north, NNE, 32 miles, (No. 4.) Required the difference of latitude and departure, and the latitude come to. Then (by right angle trigonometry,) we have the following analogy, for finding the departure, *viz.*

As radius — — — — 10.00000
to the distance AC — 32 — — — 1.50515
so is the sine of the course A 22° 30′ — — 9.58284
to the departure BC — — 12.25 — 1.08799

so the ship has made 12.25 miles of departure easterly, or has got so far to the eastward of her meridian. Then for the difference of latitude or northing the ship has made, we have (by rectangular trigonometry) the following analogy, *viz.*

As radius — — — — 10.00000
is to the distance AC — 32 — 1.50515
so is the co-sine of course A — 22° 30′ — 9.96562
to the difference of lat. AB — 29.57 — 1.47077

so the ship has differed her latitude, or made of northing, 29.57 minutes.

And since her former latitude was north, and her difference of latitude also north; therefore,

To the latitude sailed from — — 30°, 25′ N
add the difference of latitude — — 00°, 29.57

and the sum is the latitude come to 30°, 54.57 N

By this case are calculated the tables of difference of latitude, and departure, to every degree, point, and quarter-point of the compass.

Case II. Course and difference of latitude given, to find distance and departure

Example. Suppose a ship in the latitude of 45° 25′ north, sails NE*b*N ½ easterly (No 5.) till she come to the latitude of 46° 55′ north. Required the distance and departure made good upon that course.

Since both latitudes are northerly, and the course also northerly; therefore,

From the latitude come to — — — 46°, 55′
subtract the latitude sailed from — 45°, 25′
and their remains — — — 01°, 30′

the difference of latitude, equal to 90 miles.

And (by rectangular trigonometry) we have the following analogy, for finding the departure BD, *viz.*

As radius — — — — 10.00000
is to the diff. of latitude AB — 90 — 1.95424
so is the tangent of course A — 39°, 22′ 9.91404
to the departure BD — — 73 84 1.86838

so the ship has got 73 84 miles to the eastward of her former meridian.

Again, for the distance AD, we have (by rectangular trigonometry) the following proportion, *viz.*

As radius — — — — 10.00000
is to the secant of the course 39°, 22′ 10.11176
so is the difference of latitude AB 90 — 1.95424
to the distance AD — — 116.4 2.06600

Case III. Difference of latitude and distance given, to find course and departure.

Example. Suppose a ship sails from the latitude of 56° 50′ north, on a rhomb between south and west, 126 miles, and she is then found by observation to be in the latitude of 55° 40′ north. Required the course she sailed on, and her departure from the meridian. No 6.

Since the latitudes are both north, and the ship sailing towards the equator; therefore,

From the latitude sailed from — — 56° 50′
subtract the observed latitude — — 55° 10′

and the remainder — — — 01°, 40′

equal to 70 miles, is the difference of latitude.

By rectangular trigonometry we have the following proportion for finding the angle of the course F, *viz.*

As the distance sailed DF — 126 — 2.10037
is to radius — — — 10.00000
so is the diff. of latitude FD 70 — 1.84510
to the co-sine of the course F 56°, 15′ 9.74473

which, because she sails between south and west, will be south 56° 15′ west, or SW*b*W. Then, for the departure, we have (by rectangulal trigonometry) the following proportion, *viz.*

As radius — — — — 10.00000
is to the distance sailed DF — 126 — 2.10037
so is the sine of the course F — 56°, 15′ 9 91985
to the departure DE — — 104.8 — 2.02022

consequently she has made 104.8 miles of departure westerly.

Case IV. Difference of latitude and departure given, to find course and distance.

Example. Suppose a ship sails from the latitude of 44° 50′ north, between south and east, till she has made 64 miles of easting, and is then found by observation to be in the latitude of 42° 56′ north. Required the course and distance made good.

Since the latitudes are both north, and the ship sailing towards the equator; therefore,

From the latitude sailed from — — 44°, 50′N
take the latitude come to — — 42°, 56′

and their remains — — — 01°, 54′

equal to 114 miles, the difference of latitude or southing.

In this case by (rectangular trigonometry) we have the following proportion to find the course KGL (No. 7.) *viz.*

As the diff. of latitude GK 114 — 2.05690
is to radius — — — — 10.00000
so is the departure KL — 64 — 1.80618

10

to the trangent of courſe G — 29°, 19′ — 9.74928
which, becauſe the ſhip is ſailing between ſouth and eaſt, will be ſouth 29° 19′ eaſt, or SSE ½ eaſt nearly.

Then for the diſtance, we ſhall have (by rectangular trigonometry) the following analogy, *viz.*

As radius — — — — 10.00000
is to the diff. of latitude GK 114 — 2,05690
ſo is the ſecant of the courſe — 29°, 19′ 10.05952
to the diſtance GL — — 130.8 — 2.11642
conſequently the ſhip has ſailed on a SSE ½ eaſt courſe 130 8 miles.

Case V. Diſtance and departure given, to find courſe and difference of latitude.

Example. Suppoſe a ſhip at ſea ſails from the latitude of 34° 24′ north, between north and weſt 124 miles, and is found to have made of weſting 86 miles. Required the courſe ſteered, and the difference of latitude or northing made good.

In this caſe (by rectangular trigonometry) we have the following proportion for finding the courſe ADB, (No. 8.) *viz.*

As the diſtance AD — 124 — 2.09342
is to radius — — — — 10.00000
ſo is the departure AB — 86 — 1.93450
to the ſine of the courſe D 43°, 54′ — 9.84108
ſo the ſhip's courſe is north 33° 54′ weſt, or NW*b*N ¼ weſt nearly.

Then for the difference of latitude, we have (by rectangular trigonometry) the following analogy, *viz.*;

As radius — — — — 10 00000
is to the diſtance AD — 124 — 2.09342
ſo is the co-ſine of the courſe 43°, 54′ — 9 85766
to the diff. of latitude BD — 89.35 — 1.95108
which is equal to 1 degree and 29 minutes nearly. Hence, to find the latitude the ſhip is in, ſince both latitudes are north, and the ſhip ſailing from the equator; therefore,

To the latitude ſailed from — — 34°, 24′
add the difference of latitude — — 1°, 29′

the ſum is — — — — 35°, 53
the latitude the ſhip is in north.

Case VI. Courſe and departure given, to find diſtance and difference of latitude.

Example. Suppoſe a ſhip at ſea, in the latitude of 24° 30′ ſouth, ſails SE*b*S, till ſhe has made of eaſting 96 miles. Required the diſtance and difference of latitude made good on that courſe.

In this caſe, by *Rectangular Trigonometry*, and by Caſe 2. we have the following proportion for finding the diſtance, (No 9.) *viz.*

As the ſine of the courſe G 33°, 45′ — 9.74474
is to the departure HM — 96 — 1.98227
ſo is radius — — — — 10.00000
to the diſtance GM — 172.8 — 2.23753

Then, for the difference of latitude, we have (by rectangular trigonometry) the following analogy, *viz.*

As the tangent of courſe — 33°, 45′ — 9.82489
is to the departure HM — 96 — — 1.98227
ſo is radius — — — — 10.00000
to the difference of latitude GH — 143.7 — 2.15738

equal to 2°, 24′ nearly. Conſequently, ſince the latitude the ſhip ſailed from was ſouth, and ſhe ſailing ſtill towards the ſouth,

To the latitude ſailed from — — 24°, 30′
add the difference of latitude — — — 2°, 24′

and the ſum — — — — 26°, 54
is the latitude ſhe is come to ſouth.

6. When a ſhip ſtems ſeveral courſes in 24 hours, then the reducing all theſe into one, and thereby finding the courſe and diſtance made good upon the whole, is commonly called the reſolving of a traverſe.

7. At ſea they commonly begin each day's reckoning from the noon of that day, and from that time they ſet down all the different courſes and diſtances ſtemmed by the ſhip till noon next day upon the log-board; then from theſe ſeveral courſes and diſtances had from the compaſs and log line, they compute the difference of latitude and departure for each courſe (by *Caſe* 1. *of Plain Sailing*;) and theſe, together with the courſes and diſtances, are ſet down in a table called the traverſe table; which conſiſts of five columns: in the firſt of which are placed the courſes and diſtances; in the two next the differences of latitude belonging to theſe courſes, according as they are north or ſouth; and in the two laſt are placed the departures belonging to theſe courſes, according as they are eaſt or weſt. Then they ſum up all the northings, and all the ſouthings; and taking the difference of theſe, they know the difference of latitude made good by the ſhip in the laſt 24 hours, which will be north or ſouth, according as the ſum of the northings or ſouthings is greateſt: The ſame way, by taking the ſum of all the eaſtings, and likewiſe of all the weſtings, and ſubtracting the leſſer of theſe from the greater, the difference will be the departure made good by the ſhip laſt 24 hours, which will be eaſt or weſt according as the ſum of the eaſtings is greater or leſs than the ſum of the weſtings; then from the difference of latitude and departure made good by the ſhip laſt 24 hours, found as above, they find the true courſe and diſtance made good upon the whole (by *Caſe* 4. *of Plain Sailing*), as alſo the courſe and diſtance to the intended port.

Example. Suppoſe a ſhip at ſea, in the latitude of 48° 24′ north at noon any day, is bound to a port in the latitude of 43° 40′ north, whoſe departure from the ſhip is 144 miles eaſt; conſequently the direct courſe and diſtance of the ſhip is SSE ½ eaſt 315 miles; but by reaſon of the ſhifting of the winds ſhe is obliged to ſteer the following courſes till noon next day, *viz.* SE*b*S 56 miles, SSE 64 miles, NW*b*W 48 miles, S*b*W ½ weſt 54 miles, and SE*b*S ½ eaſt 74 miles. Required the courſe and diſtance made good the laſt 24 hours, and the bearing and diſtance of the ſhip from the intended port.

The ſolution of this traverſe depends entirely on the 1ſt and 4th *caſes of Plain Sailing*; and firſt we muſt (by *Caſe* 1.) find the difference of latitude and departure for each courſe. Thus,

1 Courſe SE*b*S diſtance 56 miles.
For departure.

As radius — — — — 10.00000
is to the diſtance — 56 — 1.74819
ſo

so is the sine of the course 33°, 45′ — 9.74474
to the departure — 31.11 — 1.49293

For difference of latitude.

As radius — — — — 10.00000
is to the distance — 56 — 1.74819
so is the co-sine of the course 33°, 45′ — 9.91985
to the diff. of latitude — 46.57 — 1.66804

2. Course SSE and distance 64 miles.

For departure.

As radius — — — 10.00000
is to the distance — 64 — 1.80618
so is the sine of the course 22°, 30′ — 9.58284
to the departure — 24.5 — 1.38902

For difference of latitude.

As radius — — — 10.00000
is to the distance — 64 — 1.80618
so is the co-sine of the course 22°, 30′ — 9.96562
to the difference of latitude 59.13 — 1.77180

3. Course NW*b*W and distance 48 miles.

For departure.

As radius — — — 10.00000
is to the distance — 48 — 1.68124
so is the sine of the course 56°, 15′ — 9.91985
to the departure — 39.91 — 1.60109

For difference of latitude.

As radius — — — 10.00000
is to the distance — 48 — 1.68124
so is the co-sine of the course 56°, 15′ — 9.74474
to the difference of latitude 26.67 — 1.42598

4. Course S*b*W ½ west and distance 54 miles.

For departure.

As radius — — — 10.00000
is to the distance — 54 — 1.73239
so is the sine of the course 16°, 52′ — 9.46262
to the departure — 15.67 — 8.19501

For difference of latitude.

As radius — — — 10.00000
is to the distance — 54 — 1.73239
so is the co sine of the course 16°, 52′ — 9.98090
to the difference of latitude 51.67 — 1.71329

5. Course SE*b*S ½ east and distance 74 miles.

For departure.

As radius — — — 10.00000
is to the distance — 74 — 1.86923
so is the sine of the course 39°, 22′ — 9.80228
to the departure — 46.94 — 1.67151

For difference of latitude.

As radius — — — 10.00000
is to the distance — 74 — 1.80923
so is the co-sine of the course 39°, 22′ — 9.88824
to the difference of latitude 57.21 — 1.75747

Now these several courses and distances, together with the differences of latitude and departures deduced from them, being set down in their proper columns in the traverse table, will stand as on next column.

From that table it is plain, since the sum of the northings is 26.67, and of the southings 214.58, the difference between these, *viz.* 187.91. will be the southing made good by the ship the last 24 hours; also the sum of the eastings being 102.55, and of the westings 55.58, the difference 46 97 will be the easting or departure made good by the ship's

The Traverse Table.

Courses	*Distances*	*Diff. of Lat.* N	S	*Departure* E	W
SE*b*S —	56		46 57	31.11	
S S E —	64		59.13	24.5	
NW*b*W —	48	26.67			39.91
S*b*W½West —	54		51.67		15.67
SE*b*S½East —	94		57.21	46.94	
		26.67	214.58	102.55	55.58
			26.67	55.58	
		Diff. of Lat.	187.91	46 97	*Dep.*

last 24 hours; consequently, to find the true course and distance made good by the ship in that time, it will be, (by *Case* 4. *of Plain Sailing*,)

As the difference of latitude — 187 91 2.27393
is to radius — — 10.00000
so is the departure — — 46.97 1.67182
to the tangent of the course 14°, 03′ — 9.39789

which is S*b*E¼ east nearly. Then for the distance, it will be,

As radius — — 10.00000
is to the difference of latitude 187.91 2.27393
so is the secant of the course 14°, 03′ 10.01319
to the distance — — 193 7 2.28712

consequently the ship has made good the last 24 hours, on a S*b*E ¼ east course, 193,7 miles: And since the ship is sailing towards the equator; therefore,

From the latitude sailed from — 48°, 24′ N
take the diff. of latitude made good — 3 , 08 S

there remains — — 45 , 16 N

the latitude the ship is in north. And because the port the ship is bound for lies in the latitude of 43° 40′ north, and consequently south of the ship; therefore,

From the latitude the ship is in — 45°, 16′ N
take the latitude she is bound for — 43 , 40 N

and there remains — — 1 , 36

or 96 miles, the difference of latitude or southing the ship has to make. Again, the whole easting the ship had to make being 144 miles, and she having already made 46.97 or 47 miles of easting; therefore the departure or easting she still has to make will be 97 miles: consequently, to find the direct course and distance between the ship and the intended port, it will be (by *Case* 4. *of Plain Sailing*)

As the difference of latitude — 96 — 1.98227
is to radius — — 10.00000
so is the departure — 97 — 1.98677
to the tangent of the course — 45°, 19′ 10.00450

And

As radius — — 10.00000
is to the difference of latitude 96 — 1.98227
so is the secant of the course 45°, 19′ — 10.15293
to the distance — 136.5 — 2.13620

whence the true bearing and distance of the intended port is SE, 136.5 miles.

Sect. 3. *Of* Parallel Sailing.

1. Since the parallels of latitude do always decreaſe the nearer they approach the pole, it is plain a degree on any of them muſt be leſs than a degree upon the equator. Now in order to know the length of a degree on any of them, let PB (No. 10.) repreſent half the earth's axis, PA a quadrant of a meridian, and conſequently A a point on the equator, C a point on the meridian, and CD a perpendicular from that point upon the axis, which plainly will be the ſine of CP the diſtance of that point from the pole, or the co-ſine of CA its diſtance from the equator; and CD will be to AB, as the ſine of CP, or co-ſine of CA, is to the radius. Again, if the quadrant PAB is turned round upon the axis PB, it is plain the point A will deſcribe the circumference of the equator whoſe radius is AB, and any other point C upon the meridian will deſcribe the circumference of a parallel whoſe radius is CD.

Cor. I. Hence (becauſe the circumference of circles are as their radii) it follows, that the circumference of any parallel is to the circumference of the equator, as the co-ſine of its latitude is to radius.

Cor. II. And ſince the wholes are as their ſimilar parts, it will be, As the length of a degree on any parallel is to the length of a degree upon the equator, ſo is the co-ſine of the latitude of that parallel to radius.

Cor. III. Hence, as radius is to the co-ſine of any latitude, ſo are the minutes of difference of longitude between two meridians, or their diſtance in miles upon the equator, to the diſtance of theſe two meridians on the parallel in miles.

Cor. IV. And as the co-ſine of any parallel is to radius, ſo is the length of any arch on that parallel (intercepted between two meridians) in miles, to the length of a ſimilar arch on the equator, or minutes of difference of longitude.

Cor. V. Alſo, as the co-ſine of any one parallel is to the co-ſine of any other parallel, ſo is the length of any arch on the firſt, in miles, to the length of the ſame arch on the other in miles.

2. From what has been ſaid, ariſes the ſolution of the ſeveral caſes of parallel ſailing, which are as follow.

Case I. Given the difference of longitude between two places, both lying on the ſame parallel; to find the diſtance between thoſe places.

Example I. Suppoſe a ſhip in the latitude of 54° 20′ north, ſails directly weſt on that parallel till ſhe has differed her longitude 12° 45′; required the diſtance ſailed on that parallel.

Firſt, The difference of longitude reduced into minutes, or nautical miles, is 765′, which is the diſtance between the meridian ſailed from, and the meridian come to, upon the equator; then to find the diſtance between theſe meridians on the parallel of 54° 20′, or the diſtance ſailed, it will be, by *Cor.* 3. of the laſt article,

As radius — — — 10.00000
is to the co-ſine of the lat. —— 54°, 20′ —— 9.76572
ſo are the minutes of diff. long. —— 765 —— 2.88366
to the diſtance on the parallel —— 446.1 —— 2.64938

Example II. A degree on the equator being 60 minutes or nautical miles; required the length of a degree on the parallel of 51° 32′.

By *Cor.* 3. of the laſt article, it will be

As radius —— —— —— 10 00000
is to the co-ſine of the latitude 51° 32′ —— 9.79383
ſo are the minutes in 1 degree on the equa. 60 1.77815
to —— —— —— 37.32 1 57198
the miles anſwering to a degree on the parallel of 51° 32′

By this problem the following table is conſtructed, ſhewing the geographic miles anſwering to a degree on any parallel of latitude; in which you may obſerve, that the columns marked at the top with *D.L.* contain the degrees of latitude belonging to each parallel; and the adjacent columns marked at the top, *Miles*, contain the geographic miles anſwering to a degree upon theſe parallels.

A Table ſhewing how many Miles anſwer to a Degree of Longitude, at every Degree of Latitude.

D.L	*Miles*	*D.L.*	*Miles*	*D.L.*	*Miles*	*D.L.*	*Miles*	*D.L.*	*Miles*
1	59 99	19	56.73	37	47.92	55	34.41	73	17.54
2	59.97	20	56.38	38	47 28	56	33.55	74	16.53
3	59.92	21	56.01	39	46 62	57	32 68	75	15 52
4	59.86	22	55.63	40	45.95	58	31.79	76	14.51
5	59 77	23	55.23	41	45.28	59	30.90	77	13.50
6	59.67	24	54 81	42	44 95	60	30.00	78	12.48
7	59.56	25	54 38	43	43.88	61	29.09	79	11.45
8	59.42	26	53.93	44	43.16	62	28.17	80	10.42
9	59 26	27	53.46	45	42.43	63	27.24	81	9.38
10	59.08	28	52.97	46	51.68	64	26 30	82	8 35
11	58.89	29	52.47	47	40 92	65	25.36	83	7.32
12	58 68	30	51.96	48	40.15	66	24.41	84	6.28
13	58.46	31	51.43	49	39.36	67	23.45	85	5.23
14	58.22	32	50 88	50	38.57	68	22 48	86	4.18
15	57 95	33	50.32	51	37.76	69	21.50	87	3.14
16	57 67	34	49.74	52	36.94	70	205 2	88	2.09
17	57.37	35	49.15	53	36.11	71	19.54	89	1.05
18	57.06	36	48.54	54	35.26	72	18.55	90	0.00

Though

Though this table does only ſhew the miles anſwering to a degree of any parallel, whoſe latitude conſiſts of a whole number of degrees; yet it may be made to ſerve for any parallel whoſe latitude is ſome number of degrees and minutes, by making the following proportion, *viz.*

As 1 degree, or 60 minutes, is to the difference between the miles anſwering to a degree in the next greater and next leſs tabular latitude than that propoſed; ſo is the exceſs of the propoſed latitude above the next tabular latitude, to a proportional part; which, ſubtracted from the miles anſwering to a degree of longitude in the next leſs tabular latitude, will give the miles anſwering to a degree in the propoſed latitude.

Example. Required to find the miles anſwering to a degree on the parallel of 56° 44′.

Firſt, The next leſs parallel of latitude in the table than that propoſed, is that of 56°, a degree of which (by the table) is equal to 33.55 miles; and the next greater parallel of latitude in the table, than that propoſed, is that of 57°, a degree of which is (by the table) equal to 32 68 miles; the difference of theſe is 87, and the diſtance between theſe parallels is 1 degree or 60 minutes; alſo the diſtance between the parallel of 56°, and the propoſed parallel of 56° 44′, is 44 minutes: then by the preceding proportion it will be, As 60 is to 87, ſo is 44 to 638, the difference between a degree on the parallel of 56° and a degree on the parallel of 56° 44′; which therefore taken from 33.55, the miles anſwering to a degree on the parallel of 56°, leaves 32.912, the miles anſwering to a degree on the parallel of 56° 44′, as was required.

Case II. The diſtance ſailed in any parallel of latitude, or the diſtance between any two places on that parallel, being given; to find the difference of longitude.

Example. Suppoſe a ſhip in the latitude of 55° 36′ north ſails directly eaſt 685 6 miles; required how much ſhe has differed her longitude.

By Cor. 4. Art. 1. of this ſection, it will be

As the co-ſine of the lat.	55° 36′	9.75202
is to radius		10.00000
ſo is the diſtance ſailed	685 6	2 83607
to min. of diff. of long.	1213	3.08405

which reduced into degrees, by dividing by 60, makes 20° 13′, the difference of longitude the ſhip has made.

This may alſo be ſolved by help of the foregoing table, *viz.* by finding from it the miles anſwering to a degree on the propoſed parallel, and dividing with this the given number of miles, the quotient will be the degrees and minutes of difference of longitude required.

Thus in the laſt example; I find, from the foregoing table, that a degree on the parallel of 55° 36′ is equal to 33 89 miles; by this I divide the propoſed number of miles 685.6 and the quotient is 20.13 degrees, *i. e.* 20° 13′, the difference of longitude required.

Case III. The difference of longitude between two places on the ſame parallel, and the diſtance between them, being given; to find the latitude of that parallel.

Example. Suppoſe a ſhip ſails on a certain parallel directly weſt 624 miles, and then has differed her longitude 18° 46′ or 1126 miles: Required the latitude of the parallel ſhe ſailed upon.

By Cor. 3. Art. 1. of this ſection, it will be,

As the min. of diff. long.	1126	3.05154
is to the diſtance ſailed	624	2.79518
ſo is radius		10.00000
to the co ſine of the lat.	56° 21′	9.74364

conſequently the latitude of the ſhip or parallel ſhe ſailed upon was 56° 21′.

From what has been ſaid, may be ſolved the following problems.

Prob. I. Suppoſe two ſhips in the latitude of 46° 30′ north, diſtant aſunder 654 miles, ſail both directly north 256 miles, and conſequently are come to the latitude of 50° 46′ north: Required their diſtance on that parallel

By Cor. 6. Art. 1. of this Section, it will be,

As the co-ſine of	46° 30′	9.83781
is to the co-ſine of	50° 46′	9.80105
ſo is	654	2.81558
to	601	2.77882

the diſtance between the ſhips when on the parallel of 50° 46′.

Prob. II. Suppoſe two ſhips in the latitude of 45° 48′ north, diſtant 846 miles, ſail directly north till the diſtance between them is 624 miles: Required the latitude come to, and the diſtance ſailed.

By Cor. 5. Art. 1. of this Section, it will be,

As their firſt diſtance	846	2.92737
is to their ſecond diſtance	624	2.79518
ſo is the co-ſine of	45° 48′	9.84334
to the co-ſine	59, 04	9.71115

the latitude of the parallel the ſhips are come to.

Conſequently to find their diſtance ſailed,

From the latitude come to	59°, 04′
ſubtract the latitude ſailed from,	45, 48
and there remains	13, 16

equal to 796 miles, the difference of latitude or diſtance ſailed.

Sect. 4. *Of* Middle-latitude Sailing.

When two places lie both on the ſame parallel, we ſhewed in the laſt ſection, how, from the difference of longitude given, to find the miles of eaſting or weſting between them, *& e contra.* But when two places lie not on the ſame parallel, then their difference of longitude cannot be reduced to miles of eaſting or weſting on the parallel of either place: for if counted on the parallel of that place that has the greateſt latitude, it would be too ſmall; and if on the parallel of that place having the leaſt latitude, it would be too great. Hence the common way of reducing the difference of longitude between two places, lying on different parallels, to miles of eaſting or weſting, *& e contra*, is by counting it on the middle parallel between the places, which is found by adding the latitudes of the two places together, and taking half the ſum, which will be the latitude of the middle parallel required. And hence ariſes the ſolution of the following caſes.

Case I. The latitudes of two places, and their difference of longitude, given; to find the direct courſe and diſtance.

Example,

Example. Required the direct course and distance between the Lizard in the latitude of 50° 00′ north, and longitude of 5° 14′ west, and St Vincent in the latitude of 17° 10′ N. and longitude of 24 20 W.

First, To the latitude of the Lizard	—	50°, 00′ N.
add the latitude of St Vincent	—	17 , 10
The sum is	— —	67 , 10
Half the sum or latitude of the middle parallel is	—	33 , 35 N.
Also the difference of latitude is	—	33 , 50

equal to 1970 miles of southing. Again,

From the longitude of St Vincent	—	24 , 20 W.
take the longitude of the Lizard	—	05 , 14
there remains	— —	16 , 06

equal to 1146 min. of diff. of long. west.

Then for the miles of westing, or departure, it will be, by *Case* 1. *of Parallel Sailing*,

As radius	— —	10.00000
is to the co-sine of the middle parallel	— 33° 35′ —	9.92069
so is min. diff. of long.	— 1146 —	3.05918
to the miles of westing	— 954.7 —	2.97987

And for the course it will be, by *Case* 4. *of Plain Sailing*,

As the diff. of lat.	— 1970 —	3.29447
is to radius	— —	10.00000
so is the departure	— 954.7 ——	2.97987
to the tang. of the course	25°, 51′ ——	9.68540

which, because it is between south and west, it will be SSW ¼ west nearly.

For the distance, it will be, by the same case,

As radius	—— —— ——	10.00000
is to the diff. of lat.	—— 1970 ——	3.29447
so is the secant of the course	25°, 51′	10.04579
to the distance	— 2189 ——	3.34026

whence the direct course and distance from the Lizard to St Vincent is SSW ¼ W, 2189 miles.

Case II. One latitude, course, and distance sailed being given, to find the other latitude and difference of longitude.

Example. Suppose a ship in the latitude of 50° 00′ north, sails south 50° 06′ west, 150 miles: Required the latitude the ship has come to, and how much she has differed her longitude.

First, For the difference of latitude, it will be, by *Case* 1. *of Plain Sailing*,

As radius	—— ——	10.00000
is to the distance	—— 150 ——	2.17609
so is the co sine of the course	50°, 06′	9.80716
to the diff. of latitude	—— 96.22 ——	1.98325

equal to 1°, 36′. And since the ship is sailing towards the equator; therefore,

From the latitude she was in	——	50°, 00′
take the diff. of latitude	—— ——	1 , 36
and there remains	—— ——	48 , 24

the latitude she has come to north. Consequently the latitude of the middle parallel will be 49° 12′.

Then for departure or westing it will be, by the same *case*,

As radius	—— ——	10.00000
is to the distance	— 150 —	2.17609
so is the sine of the course	50° 06′ —	9.88489
to the departure	—— 115.1 —	2.06098

As for the difference of longitude, it will be, by *Case* 2. *of Plain Sailing*.

As the co sine of the middle parallel	49° 12′	9.81519
is to radius	—— ——	10.00000
so is the departure	—— 115.1 —	2.06098
to the min. diff. of longitude	176.1 —	2.24579

equal to 2° 56, which is the difference of longitude the ship has made westerly.

Case III. Course and difference of latitude given; to find the distance sailed, and difference of longitude.

Example. Suppose a ship in the latitude of 53° 34′ north, sails SE*b*S, till by observation she is found to be in the latitude of 51° 12′, and consequently has differed her latitude 2° 22′ or 142 miles: Required the distance sailed, and the difference of longitude.

First, for the departure, it will be (by *Case* 2. *of Plain Sailing*,)

As radius	—— ——	10.00000
is to the diff. of latitude	— 142 —	2.15229
so is the tang. of course	— 33° 45′ —	9.82489
to the departure	— 94.88 —	1.97718

And for the distance it will be, by the same *Case*,

As radius	—— ——	10.00000
is to the diff. of latitude	— 142 —	2.15229
so is the secant of the course	33° 45′ —	10.08015
to the distance	— 170.8 —	2.23244

Then, since the latitude sailed from was 53° 34′ north, and the latitude come to 51° 12′ north; therefore the middle parralel will be 52° 23′; and consequently, for the difference of longitude, it will be (by *Case* 2. *of Parallel Sailing*)

As the co-sine of the mid. parallel	52° 23′	9.78560
is to the departure	—— — 94.88	1.97718
so is radius	—— ——	10.00000
to min. of diff. of longitude	— 155.5	2.19158

equal to 2° 35′ the difference of longitude easterly.

Case IV. Difference of latitude and distance sailed, given; to find the course and difference of longitude.

Example. Suppose a ship in the latitude of 43° 26′ north, sails between south and east, 246 miles, and then is found by observation to be in the the latitude of 41° 06′ north: Required the direct course and difference of longitude.

First, For the course, it will be, by *Case* 3. *of Plain Sailing*.

As the distance	—— 246 ——	2.39094
is to radius	—— —— ——	10.00000
so is the diff. of latitude	—— 140 ——	2.14613
to the co-sine of the course	55° 19′ ——	9.75519

which, because the ship sails between south and east, will be south 55° 19′ east, or SE*b*E nearly.

Then for departure, it will be, by the same *Case*,

As radius	—— —— ——	10.00000
is to the distance	—— 246 ——	2.39094

ſo is the ſine of the courſe 55° 19′ —— 9.91504
to the departure —— 202.3 —— 2.30598

Laſtly, For the difference of longitude, it will be, by *Caſe* 2. of *Parallel Sailing*,

As the co-ſine of the mid. par. 42° 16′ —— 9.86924
is to the departure —— 302.3 —— 2.30598
ſo is radius —— —— —— 10.00000
to min. of diff. of longitude 273.3 —— 2.43674
equal to 4° 33′, the difference of longitude eaſterly.

CASE V. Courſe and departure given, to find difference of latitude, difference of longitude, and diſtance ſailed.

EXAMPLE. Suppoſe a ſhip in the latitude of 48° 23′ north, ſails SW*b*S, till ſhe has made of weſting 123 miles: Required the latitude come to, the difference of longitude, and the diſtance ſailed.

Firſt, For the diſtance, it will be, by *Caſe* 6. of *Plain Sailing*,

As the ſine of the courſe — 33°, 45′ —— 9.74474
is to the departure —— 123 —— 2.08991
ſo is radius —— —— —— 10.00000
to the diſtance —— 221.4 —— 2.34517

And for the difference of latitude it will be, by the ſame *Caſe*,

As the tang. of courſe —— 33°, 45′ —— 9.82489
is to the departure —— 123 —— 2.08991
ſo is radius —— —— —— 10.00000
to the diff. of latitude —— 184 —— 2.26502
equal to 3° 04′: And ſince the ſhip is ſailing towards the equator, the latitude come to will be 45° 19′ north; and conſequently the middle parallel will be 46° 51′.

Then to find the difference of longitude, it will be, by *Caſe* 2. of *Parallel Sailing*,

As the co-ſine of mid. par. 46°, 51′ —— 9.83500
is to departure —— 123 —— 2.08991
ſo is radius —— —— —— 10.00000
to min. of diff. of longit. —— 180 —— 2.25491
which is equal to 3° 00′, the difference of longitude weſterly.

CASE VI. Difference of latitude and departure given, to find courſe, diſtance, and difference of longitude.

EXAMPLE. Suppoſe a ſhip in the latitude of 46° 37′ north, ſails between ſouth and eaſt, till ſhe has made of eaſting 146 miles, and is then found by obſervation to be in the latitude of 43° 24′ north; required the courſe, diſtance, and difference of longitude.

Firſt, By *Caſe* 4. of *Plain Sailing*, it will be for the courſe,

As the diff. of latitude —— 193 —— 2.28556
is to departure —— 146 —— 2.16137
ſo is radius —— —— —— 10.00000
to the tang. of the courſe —— 36°, 55′ —— 9.87581
which, becauſe the ſhip is ſailing between ſouth and eaſt, will be ſouth 36° 55′ eaſt, or SE*b*S ¼ eaſt nearly.

For the diſtance, it will be, by the ſame *Caſe*,

As radius —— —— —— 10.00000
is to the diff. of latitude —— 193 —— 2.28556
ſo is the ſecant of the courſe 36°, 55′ —— 10.09718
to the diſtance —— 241.4 —— 2.38274

Then for the difference of longitude, it will be, by *Caſe* 2. of *Parallel Sailing*,

As the co-ſine of the mid. par. 45°, 00′ 9.84949
is to the departure —— —— 146 —— 2.16137
ſo is radius —— —— —— 10.00000
to min. of diff. of longitude —— 205 —— 2.31188
equal to 3° 25′, the difference of longitude eaſterly.

CASE VII. Diſtance and departure given, to find difference of latitude, courſe, and difference of longitude.

EXAMPLE. Suppoſe a ſhip in the latitude of 33° 40′ north, ſails between ſouth and eaſt 165 miles, and has then made of eaſting 112.5 miles; required the difference of latitude, courſe, and difference of longitude.

Firſt, For the courſe, it will be, by *Caſe* 5. of *Plain Sailing*,

As the diſtance — 165 —— 2.21748
is to radius — — — — 10.00000
ſo is the departure —— 102.5 —— 2.05115
to the ſine of the courſe 42°, 59′ —— 9.83367
which, becauſe the ſhip ſails between ſouth and eaſt, will be ſouth 42° 59′ eaſt or SE*b*E ½ eaſt nearly.

And for the difference of latitude, it will be, by the ſame *Caſe*,

As radius — — — — 10.00000
is to the diſtance — 165 — 2.21748
ſo is the co-ſine of the courſe 42° 59′ — 9.86436
to the difference of lat. — 120.7 — 2.08184
equal to 2° 00′; conſequently the latitude come to will be 31° 40′ north, and the latitude of the middle parallel will be 32° 40′. Hence, to find the difference of longitude, it will be, by *Caſe* 2. of *Parallel Sailing*,

As the co-ſine of the mid. par. 32°, 40′ — 9.92522
is to the departure —— 112.5 —— 2.05115
ſo is radius — — — — 10.00000
to min. of diff. of long. —— 133.6 — 2.12593
equal to 2° 13′ nearly, the difference of longitude eaſterly.

CASE VIII. Difference of longitude and departure given, to find difference of latitude, courſe, and diſtance ſailed.

EXAMPLE. Suppoſe a ſhip in the latitude of 50° 46′ north, ſails between ſouth and weſt, till her difference of longitude is 3° 12′, and is then found to have departed from her former meridian 126 miles; required the difference of latitude, courſe, and diſtance ſailed.

Firſt, For the latitude ſhe has come to, it will be, by *Caſe* 3. of *Parallel Sailing*,

As min. of diff. of long. —— 192 —— 2.28330
is to departure —— 126 —— 2.10037
ſo is radius —— —— —— 10.00000
to the co-ſine of the mid. par. — 48°, 59′ — 9.81707

Now ſince the middle latitude is equal to half the ſum of the two latitudes (by Art. 1. of this Sect.) and ſo the ſum of the two latitudes equal to double the middle latitude; it follows, that if from double the middle latitude we ſubtract any one of the latitudes, the remainder will be the other. Hence from twice 48° 59′, *viz.* 97° 58′ taking 50° 46′ the latitude ſailed from, there remains 47° 12′ the latitude come to; conſequently the difference of latitude is 3° 34′, or 214 minutes.

Then for the courſe, it will be, by *Caſe* 4. of *Plain Sailing*,

As diff. of lat. —— 214 —— 2.33041

is to radius — — — 10.00000
so is the departure — 126 — 2.10037
to the tang. of the course 30°, 29′ — 9.76996
which, because it is between south and west, will be south 30° 29′ west, or SSW $\frac{3}{4}$ west nearly.

And for the distance, it will be, by the same *Case*,
As radius — — — — 10.00000
is to the diff. of lat. — 214 — 2.33041
so is the secant of the course 30°, 29′ — 10.06461
to the distance — 248.4 — 2.39502

2 From what has been said, it will be easy to solve a traverse, by the rules of *Middle Latitude Sailing*.

Example. Suppose a ship in the latitude of 43° 25′ north, sails upon the following courses, *viz.* SW*b*S 63 miles, SSW$\frac{1}{2}$west 45 miles, S*b*E 54 miles, and SW*b*W 74 miles: Required the latitude the ship has come to, and how far she has differed her longitude.

First, By *Case* 2. of this *Sect.* find the difference of latitude and difference of longitude belonging to each course and distance, and they will stand as in the following table.

Courses	*Distances*	*Diff. of Lat.* N	*Diff. of Lat.* S	*Diff. of Longit.* E	*Diff. of Longit.* W
SW*b*S	63	—	52 4	—	47.85
SSW$\frac{1}{2}$W	45	—	39 7	—	28.62
S*b*E	54	—	53 0	13 75	—
SW*b*W	74	—	41.1	—	81 08
					157.55
Diff. of Lat.			186.2		13.75
				Diff. of Long.	143.80

Hence it is plain the ship has differed her latitude 186.2 minutes, or 3° 6′ and so has come to the latitude of 40° 19′ north, and has made of difference of longitude 143.8 minutes, or 2° 23′ 48″ westerly.

3. This method of sailing, though it be not strictly true, yet it comes very near the truth, as will be evident, by comparing an example wrought by this method with the same wrought by the method delivered in the next *Section*, which is strictly true; and it serves, without any considerable error, in runnings of 450 miles between the equator and parallel of 30 degrees, of 300 miles between that and the parallel of 60 degrees, and of 150 miles as far as there is any occasion, and consequently must be sufficiently exact for 24 hours run.

Sect. 5. *Of* Mercator's Sailing.

1. Though the meridians do all meet at the pole, and the parallels to the equator do continually decrease, and that in proportion to the co-sines of their latitudes; yet in old sea charts the meridians were drawn parallel to one another, and consequently the parallels of latitude made equal to the equator, and so a degree of longitude on any parallel as large as a degree on the equator: also in these charts the degrees of latitude were still represented (as they are in themselves) equal to each other, and to those of the equator. By these means the degrees of longitude being increased beyond their just proportion, and the more so the nearer they approach the pole, the degrees of latitude at the same time remaining the same, it is evident places must be very erroneously marked down upon these charts with respect to their latitude and longitude, and consequently their bearing from one another very false.

2. To remedy this inconvenience, so as still to keep the meridians parallel, it is plain we must protract, or lengthen, the degrees of latitude in the same proportion as those of longitude are, that so the proportion in easting and westing may be the same with that of southing and northing, and consequently the bearings of places from one another be the same upon the chart as upon the globe itself.

Let ABD (No. 11.) be a quadrant of a meridian, A the pole, D a point on the equator, AC half the axis, B any point upon the meridian, from which draw BF perpendicular to AC, and BG perpendicular to CD; then BG will be the sine, and BF or CG the co-sine of BD the latitude of the point B; draw D the tangent and CE the secant of the arch CD. It has been demonstrated in Sect. 3. that any arch of a parallel is to the like arch of the equator as the co sine of the latitude of that parallel is to radius. Thus any arch as a minute on the parallel described by the point B, will be to a minute on the equator as BF or CG is to CD; but since the triangles CGB CDE are similar, therefore CG will be to CD as CB is to CE, *i. e.* the co-sine of any parallel is to radius as radius is to the secant of the latitude of that parallel. But it has been just now shown, that the co sine of any parallel is to radius, as the length of any arch as a minute on that parallel is to the length of the like arch on the equator: Therefore the length of any arch as a minute on any parallel, is to the length of the like arch on the equator, as radius is to the secant of the latitude of that parallel; and so the length of any arch, as a minute on the equator, is longer than the like arch of any parallel in the same proportion, as the secant of the latitude of that parallel is to radius. But since in this projection the meridians are parallel, and consequently each parallel of latitude equal to the equator, it is plain the length of any arch as a minute on any parallel, is increased beyond its just proportion, at such rate as the secant of the latitude of that parallel is greater than radius; and therefore to keep up the proportion of northing and southing to that of easting and westing, upon this chart, as it is upon the globe itself, the length of a minute upon the meridian at any parallel must also be increased beyond its just proportion at the same rate, *i. e.* as the secant of the latitude of that parallel is greater than radius. Thus to find the length of a minute upon the meridian at the latitude of 75 degrees, since a minute of a meridian is every where equal on the globe, and also equal to a minute upon the equator, let it be represented by unity: then making it as radius is to the secant of 75 degrees, so is unity to a fourth number, which is 3.864 nearly; and consequently, by whatever line you represent one minute on the equator of this chart, the length of one minute on the enlarged meridian

meridian at the latitude of 75 degrees, or the diſtance between the parallel of 75° 00′ and the parallel of 75° 01′, will be equal to 3 of theſe lines, and $\frac{864}{1000}$ of one of them. By making the ſame proportion, it will be found, that the length of a minute on the meridian of this chart at the parallel of 60°, or the diſtance between the parallel of 60° 00′ and that of 60° 01′, is equal to two of theſe lines. After the ſame manner, the length of a minute on the enlarged meridian may be found at any latitude; and conſequently beginning at the equator, and computing the length of every intermediate minute between that and any parallel, the ſum of all theſe ſhall be the length of a meridian intercepted between the equator and that parallel; and the diſtance of each degree and minute of latitude from the equator upon the meridian of this chart, computed in minutes of the equator, forms what is commonly called a table of meridional parts.

If the arch BD (No. 11.) repreſent the latitude of any point B, then (CD being radius) CE will be the ſecant of that latitude: but it has been ſhown above, that radius is to the ſecant of any latitude, as the length of a minute upon the equator is to the length of a minute on the meridian of this chart at that latitude; therefore CD is to CE, as the length of a minute on the equator is to the length of a minute upon the meridian, at the latitude of the point B. Conſequently, if the radius CD be taken equal to the length of a minute upon the equator, CE, or the ſecant of the latitude, will be equal to the length of a minute upon the meridian at that latitude. Therefore, in general, if the length of a minute upon the equator be made radius, the length of a minute upon the enlarged meridian will be every where equal to the ſecant of the arch contained between it and the equator.

Cor. 1. Hence it follows, ſince the length of every intermediate minute between the equator and any parallel, is equal to the ſecant of the latitude (the radius being equal to a minute upon the equator) the ſum of all theſe lengths, or the diſtance of that parallel on the enlarged meridian from the equator, will be equal to the ſum of all the ſecants, to every minute contained between it and the equator.

Cor. 2. Conſequently the diſtance between any two parallels on the ſame ſide of the equator is equal to the difference of the ſums of all the ſecant contained between the equator and each parallel, and the diſtance between any two parallels on contrary ſides of the equator is equal to the ſum of the ſums of all the ſecants contained between the equator and each parallel.

5. By the tables of meridional parts, which may be ſeen in Paton, and other writers on this ſubject, may be conſtructed the nautical chart, commonly called Mercator's chart. Thus, for example, let it be required to make a chart that ſhall commence at the equator, and reach to the parallel of 60 degrees, and ſhall contain 80 degrees of longitude.

Draw the line EQ repreſenting the equator, (ſee No. 12.) then take, from any convenient line of equal parts, 4800 (the number of minutes contained in 80 degrees,) which ſet off from E to Q, and this will determine the breadth of the chart.

Divide the line EQ into eight equal parts, in the points 10, 20, 30, &c. each containing 10 degrees, and each of theſe divided into 10 equal parts will give the ſingle degrees upon the equotor; then through the points E, 10, 20, &c. drawing lines perpendicular to EQ, theſe ſhall be meridians.

From the ſcale of equal parts take 4527.4 (the meridional parts anſwering to 60 degrees,) and ſet that off from E to A and from Q to B, and join AB; then this line will repreſent the parallel of 60, and will determine the length of the chart.

Again, from the ſcale of equal parts take 603.1 (the meridional parts anſwering to 10 degrees,) and ſet that off from E to 10 on the line EA; and through the point 10 draw 10, 10, parallel to EQ; and this will be the parallel of 10 degrees. The ſame way, ſetting off from E on the line EA, the meridional parts anſwering to each degree, &c. of latitude, and through the ſeveral points drawing lines parallel to EQ, we ſhall have the ſeveral parallels of latitude.

If the chart does not commence from the equator, but is only to ſerve for a certain diſtance on the meridian between two given parallels on the ſame ſide of the equator; then the meridians are to be drawn as in the laſt example: and for the parallels of latitude you are to proceed thus, *viz.* from the meridional parts anſwering to each point of latitude in your chart, ſubtract the meriodinal parts anſwering to the leaſt latitude, and ſet off the differences ſeverally, from the parallel of leaſt latitude, upon the two extreme meridians; and the lines joining theſe points of the meridians ſhall repreſent the ſeveral parallels upon your chart.

Thus let it be required to draw a chart that ſhall ſerve from the latitude of 20 degrees north to 60 degrees north, and that ſhall contain 80 degrees of longitude.

Having drawn the line DC to repreſent the parallel of 20 degrees (ſee No. 12.) and the meridians to it, as in the foregoing example; ſet off 663.3 (the difference between the meridional parts anſwering to 30 degrees, and thoſe of 20 degrees) from D to 30, and from C to 30; then join the points 30 and 30 with a right line, and that ſhall be the parallel of 30. Alſo ſet off 1397.6 (the difference between the meridional parts anſwering to 40 degrees, and thoſe of 20 degrees) from D to 40, and from C to 40, and joining the points 40 and 40 with a right line, that ſhall be the parallel of 40. And proceeding after the ſame way, we may draw as many of the intermediate parallels as we have occaſion for.

But if the two parallels of latitude that bound the chart, are on the contrary ſides of the equator; then draw a line repreſenting the equator and meridians to it, as in the firſt example; and from the equator ſet off on each ſide of it the ſeveral parallels contained between it and the given parallels as above, and your chart is finiſhed.

If Mercator's chart, conſtructed as above, hath its equator extended on each ſide of the point E 180 degrees, and if the ſeveral places on the ſurface of the earth be there laid down according to their latitudes and longitudes, we ſhall have what is commonly called Mercator's map of the earth. This map is not to be conſidered as a ſimilar and juſt repreſentation of the earth's ſurface; for in it the figures

figures of countries are distorted, especially near the poles: but since the degrees of latitude are every where increased in the same proportion as those of longitude are, the bearings between the places will be the same in this chart as on the globe; and the proportions between the latitudes, longitudes, and nautical distances, will also be the same on this chart, as on the globe itself; by which means the several cases of navigation are solved after a most easy manner, and adapted to the meanest capacities.

N. B. Here you must take notice, that in all charts, the upper part is the north side, and the lower part or bottom is the south side; also that part of it towards the right hand is the east, and that towards the left hand the west side of the chart.

6. Since, according to this projection, the meridians are parallel right lines; it is plain, that the rhombs which form always equal angles with the meridians, will be streight lines; which property renders this projection of the earth's surface much more easy and proper for use than any other.

7. This method of projecting the earth's surface upon a plane, was first invented by Mr Edward Wright, but first published by Mercator; and hence the sailing by the chart, was called Mercator's sailing.

8. In No. 13. let A and E represent two places upon Mercator's chart, AC the meridian of A, and CE the parallel of latitude passing through E; draw AE, and set off upon AC the length AB equal to the number of minutes contained in the difference of latitude between the two places, and taken from the same scale of equal parts the chart was made by, or from the equator, or any graduated parallel of the chart, and through B draw BD parallel to CE meeting AE in D. Then AC will be the enlarged difference of latitude, AB, the proper difference of latitude, CE the difference of longitude, BD the departure, AE the enlarged distance, and AD the proper distance, between the two places A and E; also the angle BAD will be the course, and AE the rhomb line between them.

9. Now since in the triangle ACE, BD is parallel to one of its sides CE; it is plain the triangles ACE, ABD, will be similar, and consequently the sides proportional. Hence arise the solutions of the several cases in this sailing, which are as follow.

Case I. The latitudes of two places given, to find the meridional or enlarged difference of latitude between them

Of this case there are three varieties, *viz*. either one of the places lies on the equator, or both on the same side of it; or lastly, on different sides.

1. If one of the proposed places lies on the equator, then the meridional difference of latitude is the same with the latitude of the other place, taken from the table of meridional parts.

Example. Required the meridional difference of latitude between St Thomas, lying on the equator, and St Antonio in the latitude of 17° 20′ north. I look in the tables for the meridional parts answering to 17° 20′, and find it to be 1056.2, the enlarged difference of latitude required.

2. If the two proposed places be on the same side of the equator, then the meridional difference of latitude is found by subtracting the meridional parts answering to the least latitude from those answering to the greatest, and the difference is that required.

Example. Required the meridional difference of latitude between the Lizard in the latitude of 50° 00′ north, and Antigua in the latitude of 17° 30′ north.

From the meridional parts of —	50°, 00′ —	3474.5
subtract the meridional parts of	17°, 30′ —	1066.7
there remains — —		2407.8

the meridional difference of latitude required.

3. If the places lie on different sides of the equator, then the meridional difference of latitude is found by adding together the meridional parts answering to each latitude, and the sum is that required.

Example. Required the meridional difference of latitude between Antigua in the latitude of 17° 30′ north, and Lima in Peru in the latitude of 12° 30′ South.

To the merid. parts answering to	17°, 30′	1066.7
add these answering to —	12°, 30′ —	756.1
the sum is — — —		1822.8

the meridional difference of latitude required.

Case II. The latitudes and longitudes of two places given, to find the direct course and distance between them.

Example. Required to find the direct course and distance between the Lizard in the latitude of 50° 00′ north, and Port-Royal in Jamaica in the latitude of 17° 40′; differing in longitude 70° 46′, Port-Royal lying so far to the westward of the Lizard.

Preparation.

From the latitude of the Lizard	—	50°, 00′
subtract the latitude of Port-Royal	—	17 , 40
and there remains —	—	32 , 20

equal to 1940 minutes, the proper difference of latitude.

Then from the meridional parts of	50°, 00′	3474.5
subtract those of — —	17 , 40	1077.2
and there remains — —		2397.3

the meridional or enlarged difference of longitude.

Geometrically. Draw the line AC (No 14.) representing the meridian of the Lizard at A, and set off from A, upon that line, AE equal to 1940 (from any scale of equal parts) the proper difference of latitude, also AC equal to 2397 3 (from the same scale) the meridional or enlarged difference of latitude Upon the point C raise CB perpendicular to AC, and make CB equal to 4246 the minutes of difference of longitude.

Join AB, and through E draw ED parallel to BC: so the case is constructed; and AD applied to the same scale of equal parts the other legs were taken from will give the direct distance, and the angle DAE measured by the line of chords will give the course.

By Calculation.

For the angle of the course EAD, it will be, (by Rectangular Trigonometry,)

AC : CB : : R : T, BAC, *i. e.*

As the meridional diff. of lat. 2397.3 — 3 37970

is

is to the difference of long. — 4246.0 — 3.62798
so is radius — — — 10.00000
to the tang. of the direct course 60° 33′ — 10.34828
which, because Port Royal is southward of the Lizard, and the difference of longitude westerly, will be south 60° 33′ west, or SW*b*W ½ west nearly.

Then for the distance AD, it will be, (by rectangular trigonometry)

R : AE : : Sec. A : AD, *i. e.*

As the radius — — — — 10.00000
is to the proper diff. of lat. — 1940 — 3.28780
so is the secant of the course — 60° 33′ — 10.30833
to the distance — — 3945.6 — 3.59613
consequently the direct course and distance between the Lizard and Port-Royal in Jamaica, is south 60° 33′, 3945.6 miles.

Case III. Course and distance sailed given, to find difference of latitude and difference of longitude.

Example. Suppose a ship from the Lizard in the latitude of 50° 00′ north, sails south 35° 40′ west 156 miles. Required the latitude come to, and how much she has altered her longitude.

Geometrically. 1. Draw the line BK (No. 15.) representing the meridian of the Lizard at B; from B draw the line BM, making with BK an angle equal to 35° 40′, and upon this line set off BM equal to 156 the given distance, and from M let fall the perpendicular MK upon BK.

Then for BK the proper difference of latitude, it will be, (by rectangular trigonometry,)

R : MB : : S, BMK : BK,

i. e. As radius — — — 10.00000
is to the distance — 156 — 2.19312
so is the co-sine of the course 35° 40′ — 9.90978
to the proper difference of lat. 127 — 2.10290
equal to 2° 07′; and since the ship is sailing from a north latitude towards the south, therefore the latitude come to will be 47° 53′ north. Hence the meridional difference of latitude will be 193.4.

2. Produce BK to D, till BD be equal to 193.4; through D draw DL parallel to MK, meeting DM produced in L; then DL will be the difference of longitude: to find which by calculation, it will be, (by rectangular trigonometry,)

R : BD : : T, LBD : DL,

i. e. As radius — — — 10.00000
is to the meridional diff. of lat. 193.4 — 2.28646
so is the tangent of the course 35°, 40′ — 9.85594
to minutes of diff. of long. — 138.8 — 2.14240
equal to 2° 18′ 48″ the difference of longitude the ship has made westerly.

Case IV. Given course and both latitudes, *viz.* the latitude sailed from, and the latitude come to; to find the distance sailed, and the difference of longitude.

Example. Suppose a ship in the latitude of 54° 20′ north, sails south 33° 45′ east, until by observation she is found to be in the latitude of 51° 45′ north; required the distance sailed, and the difference of longitude.

Geometrically. Draw AB (No. 16.) to represent the meridian of the ship in the first latitude, and set off from A to B 155 the minutes of the proper difference of latitude, also AG equal to 257.9 the minutes of the enlarged difference of latitude. Through B and G, draw the lines BC and GK perpendicular to AG; also draw AK making with AG an angle of 33° 45′, which will meet the two former lines in the points C and K; so the case is constructed, and AC and GK may be found from the line of equal parts: To find which,

By Calculation:

First, For the difference of longitude, it will be, (by rectangular trigonometry,)

R : AG : : T, GAK : GK,

i. e. As radius — — — 10.00000
is to the enlarged diff. of lat. — 257.9 — 2.41145
so is the tang. of the course — 33°, 45′ — 9.82489
to min. of diff. of longitude — 172.3 — 2.23634
equal to 2° 52′ 18″, the difference of longitude the ship has made easterly.

This might also have been found, by first finding the departure BC (by *Case* 2. of *Plain Sailing*,) and then it would be

AB : BC : : AG : GK, the difference of longitude required.

Then for the direct distance AC, it will be, (by rectangular trigonometry,)

R : AB : : Sec. A : AC,

i. e. As radius — — — 10.00000
is to the proper diff. of lat. — 155 — 2.19033
so is the secant of the course — 33°, 45′ — 10.08015
to the direct distance — 186.4 — 2.27048
consequently the ship has sailed south 33° 45′ east 186.4 miles, and has differed her longitude 2° 52′ 18″ easterly.

Case V. Both latitudes, and distance sailed, given; to find the direct course, and difference of longitude.

Example. Suppose a ship from the latitude of 45° 26′ north, sails between north and east 195 miles, and then by observation she is found to be in the latitude of 48° 6′ north; required the direct course and difference of longitude.

Geometrically. Draw AB (No. 17.) equal to 160 the proper difference of latitude, and from the point B raise the perpendicular BD; then take 195 in your compasses, and setting one foot of them in A, with the other cross the line BD in D. Produce AB, till AC be equal to 233.6 the inlarged difference of latitude. Thro' C draw CK parallel to BD, meeting AD produced in K: so the case is constructed; and the angle A may be measured by the line of chords, and CK by the line of equal parts: To find which,

By Calculation:

First, For the angle of the course BAD it will be, (by rectangular trigonometry)

AB : R : : AD : Sec. A. *i. e.*

As the proper diff. of lat. — 160 — 2.20412
is to radius — — 10.00000
so is the distance — 195 — 2.29003
to the secant of the course — 34°, 52′ — 10.08591
which, because the ship is sailing between north and east, will be north 34° 52′ east, or NE*b*N 1° 7′ easterly.

Then for the difference of longitude, it will be, (by rectangular trigonometry,)

R : AC : : T, A : CK.

i. e. As radius	—— —— ——	10.00000
is to the merid. diff. of lat.	— 233.6 —	2.36847
ſo is the tang. of the courſe	— 34°, 52' —	9.84307
to min. of diff. of longitude	— 162.8 —	2.21154

equal to 2° 42' 48", the difference of longitude eaſterly.

CASE VI. One latitude, courſe, and difference of longitude, given; to find the other latitude, and diſtance failed.

EXAMPLE. Suppoſe a ſhip from the latitude of 48° 50' north, fails ſouth 34° 40' weſt, till her difference of longitude is 2° 44'; required the latitude come to, and the diſtance failed.

GEOMETRICALLY. 1. Draw AE (No. 18.) to repreſent the meridian of the ſhip in the firſt latitude, and make the angle EAC equal to 34° 40', the angle of the courſe; then draw FC parallel to AE, at the diſtance of 164 the minutes of difference of longitude, which will meet AC in the point C. From C let fall upon AE the perpendicular CE; then AE will be the enlarged difference of latitude. To find which *by Calculation*, it will be, (by rectangular trigonometry,)

T, A : R : : CE : AE,

i. e. As the tang. of the courſe	34°, 40' —	9.83984
is to the radius	—— ——	10.00000
ſo is min. of diff. longitude	—— 164 —	2.21484
to the enlarged diff. of latitude	— 237.2 —	2.37500

and becauſe the ſhip is failing from a north latitude ſoutherly, therefore,

From the merid. parts of the latitude failed from	— 48°, 50' —	3366.9
take the merid. difference of latitude	——	237.2
and there remains	—— —— —	3129.7

the meridional parts of the latitude come to, *viz.* 46° 09'.

Hence for the proper difference of latitude,

From the latitude failed from	——	48°, 50'N
take the latitude come to	—— ——	46 , 09 N
and there remains	—— ——	2 , 41

equal to 161, the minutes of difference of latitude.

2. Set off upon AE the length AD equal to 161 the proper difference of latitude, and through D draw DB parallel to CE: then AB will be the direct diſtance. To find which by *Calculation*, it will be, by rectangular trigonometry,

R : AD : : Sec. A : AB.

i. e. As radius	—— ——	10.00000
is to the proper diff. of latitude	161	2.20683
ſo is the ſecant of the courſe	34°, 40'	10.08488
to the direct diſtance	—— 195.8	2.29171

CASE VII. One latitude, courſe, and departure, given; to find the other latitude, diſtance failed, and difference of longitude.

EXAMPLE. Suppoſe a ſhip fails from the latitude of 54° 36' north, ſouth 42° 33' eaſt, until ſhe has made of departure 116 miles. Required the latitude ſhe is in, her direct diſtance failed, and how much ſhe has altered her longitude.

GEOMETRICALLY. 1. Having drawn the meridian AB, (No. 19.) make the angle BAD equal to 42° 33'. Draw FD parallel to AB at the diſtance of 116, which will meet AD in D. Let fall upon AB the perpendicular DB. Then AB will be the proper difference of latitude, and AD the direct diſtance: To find which by calculation, firſt, for the diſtance AD it will be (by rectangular trigonometry)

S, A : BD : : R : AD.

i. e. As the ſine of the courſe	42°, 33'	9.83010
is to the departure ——	116	2.06446
ſo is radius ——	——	10.00000
to the direct diſtance ——	171.5	2.23436

Then for the proper difference of latitude, it will be, by rectangular trigonometry.

T, A : BD : : R : AB.

i. e. As the tang. of the courſe	42°, 33'	9.96281
is to the departure ——	116	2.06446
ſo is radius ——	——	10.00000
to the proper difference of latitude	126.4	2.10165

equal to 2° 6': conſequently the ſhip has come to the latitude of 52° 30' north, and ſo the meridional difference of latitude will be 212.2.

2. Produce AB to E, till AE be equal to 212.2; and through E draw EC parallel to BD, meeting AD produced in C; then EC will be the difference of longitude; to find which by calculation, it will be, (by rectangular trigonometry)

R : AE : : T, A : EC.

i. e. As radius ——	——	10.00000
is to the merid. diff. of latitude	212.2	2.32675
ſo is the tang. of the courſe	42°, 33'	9.96281
to the min. of diff. of longitude	194.8	2.28956

equal to 3° 14' 48", the difference of longitude eaſterly.

This might have been found otherwiſe, thus: becauſe the triangles ACE, ADB, are ſimilar; therefore it will be,

AB : BD : : AE : EC.

i. e. As the proper diff. of latitude	126.4	2.10165
is to the departure ——	116	2.06446
ſo is the enlarged diff. of latitude	212.2	2.32675
to min. diff. of longitude ——	194.8	2.28956

CASE VIII. Both latitudes and departure given, to find courſe, diſtance, and difference of longitude.

EXAMPLE. Suppoſe a ſhip from the latitude of 46° 20' N. fails between ſouth and weſt, till ſhe has made of departure 126.4 miles; and is then found by obſervation to be in the latitude of 43° 25' north. Required the courſe and diſtance failed, and difference of longitude.

GEOMETRICALLY. Draw AK (No. 20.) to repreſent the meridian of the ſhip in her firſt latitude; ſet off upon it AC, equal to 165, the proper difference of latitude. Draw BC perpendicular to AC, equal to 126.4 the departure, and join AB. Set off from A, AK equal to 233.3, the enlarged difference of latitude; and through K draw KD parallel to BC, meeting AB produced in D; ſo the caſe is conſtructed, and DK will be the difference of longitude, AB the diſtance, and the angle A the courſe; to find which

BY CALCULATION:

Firſt, For DC the difference of longitude, it will be,

AC :

AC : CB : : AK : KD.

i. e. As the proper diff. of latitude — 165 — 2.21748
is to the departure — — 126.4 — 2.10175
so is the enlarged diff. of latitude — 233.3 — 2.36791
to min. of diff. longitude — 178.7 — 2.25218
equal to 2° 58′ 42″, the difference of longitude westerly.

Then for the course it will be, (by rectangular trigonometry,)

AC : BC : : R : T, A.

i. e. As the proper diff. of latitude — 165 — 2.21748
is to departure — — 126.4 — 2.10175
so is radius — — 10.00000
to the tangent of the course — 37°, 27′ — 9.88427
which, because the ship sails between south and west, will be south 37° 27′ west, or SW*b*S 6° 30′ westerly.

Lastly, For the distance AB, it will be, (by rectangular trigonometry,)

S, A : BC : : R : AB.

i. e. As the sine of the course 37°, 27′ — 9.78395
is to the departure — 126.4 — 2.10175
so is radius — — 10.00000
to the direct distance — 207.9 — 2.31780

Case IX. One latitude, distance sailed, and departure given; to find the other latitude, difference of longitude, and course.

Example. Suppose a ship in the latitude of 48° 33′ north, sails between south and east 138 miles, and has then made of departure 112.6. Required the latitude come to, the direct course, and difference of longitude.

Geometrically. 1st, Draw BD (No. 21.) for the meridian of the ship at B; and parallel to it draw FE, at the distance of 112.6, the departure. Take 138, the distance, in your compasses, and fixing one point of them in B, with the other cross the line FE in the point E; then join B and E, and from E let fall upon BD the perpendicular ED; so BD will be the proper difference of latitude, and the angle B will be the course; to find which, by calculation,

First, for the course it will be, (by rectangular trigonometry,)

BE : R : : DE : S, B.

i. e. As the distance — 138 — 2.13988
is to radius — — 10.00000
so is the departure — 112.6 — 2.05154
to the sine of the course — 54° 41′ — 9.91166
which, because the ship sails between south and east, will be south 54° 41′ east, or SE 9° 41′ easterly.

Then for the difference of latitude, it will be, (by rectangular trigonometry,)

R : BE : : Co-S, B : BD.

i. e. As radius — — 10.00000
is to the distance — 138 — 2.13988
so is the co sine of the course — 54° 41′ — 9.76200
to the difference of latitude — 79.8 — 1.90188
equal to 1° 19′. Consequently the ship has come to the latitude of 47° 13′. Hence the meridional difference of latitude will be 117.7.

2dly, Produce B to A, till BA be equal to 117.7; and through A draw AC parallel to DE, meeting BE produced in C; then AC will be the difference of longitude; to find which by calculation, it will be,

BD : DE : : BA : AC.

i. e. As the proper diff. of latitude — 79.8 — 1.90180
is to the departure — 112.6 — 2.05154
so is the enlarged diff. of latitude — 117.7 — 2.07078
to the diff of longitude — 166.1 — 2.22044
equal to 2° 46′ 06″, the difference of longitude easterly.

9. From what has been said, it will be easy to solve a traverse according to the rules of Mercator's sailing.

Example. Suppose a ship at the Lizard in the latitude 50° 00′ north, is bound to the Madera in the latitude of 32°, 20′ north, the difference of longitude between them being 11° 40′, the west end of the Madera lying so much to the westward of the Lizard, and consequently the direct course and distance (by *Case*, 2. of this *Sect.*) is south 26° 15′ west 1181.9 miles; but by reason of the winds she is forced to sail on the following courses (allowance being made for lee-way and variation, *&c.*) *viz.* SSW 44 miles, S*b*W ½ west 36 miles, SW*b*S 56 miles, and S*b*E 28 miles. Required the latitude the ship is in, her bearing and distance from the Lizard, and her direct course and distance from the Madera, at the end of these courses.

The geometrical construction of this traverse is performed by laying down the two ports according to construction of *Case* 2. of this *Sect.* and the several courses and distances according to *Case* 3. by which we have the following solution by calculation.

1. Course SSW, distance 44 miles.

For difference of latitude:

As radius — — 10.00000
is to the distance — 44 — 1.64345
so the is the co-sine of the course — 22°, 30′ — 9.96562
to the difference of latitude — 40.65 — 1.60907
and since the course is southerly, therefore the latitude come to will be 49° 20′ north, and consequently the meridional difference of latitude will be 61.8. Then

For difference of longitude,

As radius — — 10.00000
is to the enlarged diff. of lat. — 61.8 — 1.79099
so is the tang of the course — 22°, 30′ — 9.61722
to min. of diff. of longitude — 25.6 — 1.40821

2. Course S*b*W ½ west, distance 36 miles.

For difference of latitude:

As radius — — 10.00000
is to the distance — 36 — 1.55630
so is the co-sine of the course — 16°, 52′ — 9.98090
to the difference of latitude — 34.46 — 1.53720
and since the course is southerly, therefore the latitude come to will be 48° 45′. Hence the meridional difference of latitude will be 53.4. Then,

For difference of longitude:

As radius — — 10.00000
is to the enlarged diff. of lat. — 53.4 — 1.72754
so is the tan. of the course — 16°, 52′ — 9.48171
to the difference of longitude — 16.19 — 1.20925

3. Course SW*b*S, distance 56 miles.

For difference of latitude:

As radius — — 10.00000
is to the distance — 56 — 1.74819
so is the co-sine of the course — 33°, 45′ — 9.91985

to

to the difference of latitude ——	46 56	1.66804

consequently the latitude come to is 47° 59, and therefore the enlarged difference of latitude will be 69.2.

Then,

For difference of longitude:

As radius ——	——	10.00000
is to the enlarged diff. of lat.	69.2	1.84011
so is the tang. of the course	33° 45′	9.82489
to the difference of longitude	46.24	1.66500

4. Course SbE, distance 28 miles.

For difference of latitude:

As radius ——	——	10.00000
is to the distance ——	28 ——	1.44716
so is the co-sine of the course	11°, 15′	9.99157
to the differenct of latitude	27.46 ——	1 43873

consequently the latitude come to will be 47°, 31′; and hence the meridional difference of latitude will be 43.2.

Then,

For difference of longitude:

As radius ——	——	10.00000
is to the enlarged diff. of lat.	43.2	1.63548
so is the tang. of the course	11°, 15′	9.29866
to the diff. of longitude	8.59	0.93414

Now these several courses and distances, together with the difference of latitude and longitude belonging to each of them, being set down in their proper columns in the *Traverse Table*, will stand as follow.

Courses	*Distances*	*Diff. of Lat.* N	S	*Diff. of Longit.* E	W
SSW —	44	——	40.65	——	25.6
SbW½W —	36	——	34.46	——	16.19
SWbS —	56	——	46.56	——	49.24
SbE —	— 28	——	27.46	8.59	——
	Diff. of Lat.		149.13	8.59	88.03
					8.59
				Diff. of long.	79.44

Hence it is plain that the ship has made of southing 149.13 minutes, and consequently has come to the latitude of 47° 31′ north, and so the meridional difference of latitude between that and her first latitude will be 226.1; and since she has made of difference of longitude 79.44 minutes westerly; therefore for the direct course and distance between the lizard and the ship it will be, (by *Case* 2. *of this Section*.)

For the direct course:

As the merid. diff. of latitude	226.1 —	2.35430
is to radius ——	——	10.00000
so is the difference of longitude	79.44	1.90004
to the tang. of the course —	19° 22′	9.54593

which because the difference of latitude is southerly, and the difference of longitude westerly, will be south 19° 22′ west, or SbW 8° 7′ westerly. Then,

For the direct distance:

As radius ——	——	10.00000
is to the proper diff. of lat	149.13	2 17349
so is the secant of the course	19° 22′	10.02530
to the direct distance —	158 —	2.19879
From the latitude the ship is in	—	47°, 31′ N
subtract the lat. of the Madera	—	32, 20 N
and there remains ——	——	15, 11

equal to 911 minutes, the proper difference of latitude between the ship and the Madera.

Again, from the merid. parts answering to the latitude the ship is in	— 3248.4
Take the meridional parts answering to the latitude of the Madera	— 2052.0
and there remains —— ——	1196.4

the enlarged difference of latitude between the ship and the Madera.

Also, from the diff. of long. between the Lizard and the Madera	11°, 40′ W
Take the difference of long. between the Lizard and the ship —	1, 19$\frac{44}{100}$W
and there remains —— ——	10, 20$\frac{56}{100}$W

equal to 620.56 min. of difference of longitude between the ship and the Madera westerly.

Then for the direct course and distance between the ship and the Madera, it will be,

For the direct course:

As the merid. diff. of latitude	1196.4	3.07788
is to radius ——	——	10.00000
so is the difference of longitude	620.56	2.79278
to the tang. of the course —	27°, 25′	9.71493

For the direct distance:

As radius ——	——	10.00000
is to the proper diff. of latitude	911	2.95952
so is the secant of the course	27°, 25′	10.05174
to the direct distance	1027	3.01126

10. It is very common, in working a day's reckoning at sea, to find the difference of latitude and departure to each course and distance; and adding all the departures together, and all the differences of latitudes for the whole departure, and difference of latitude made good that day, from thence (by *Case* 8. of this *Section*) to find the difference of longitude, *&c.* made good that day. Now that this method is false, will evidently appear, if we consider that the same departure reckoned on two different parallels will give unequal differences of longitude; and consequently, when several departures are compounded together and reckoned on the same parallel, the difference of longitude resulting from that cannot be the same with the sum of the differences of longitude resulting from the several departures on different parallels; and therefore we have chosen, in the last *example* of a *traverse*, to find the difference of longitude answering to each particular course and distance, the sum of which must be the true difference of longitude made good by the ship on these several courses and distances.

11. We shewed, at *Art.* 5. of this *Section*, how to construct a *Mercator's chart*; and now we shall proceed to its several uses, contained in the following problems.

Prob. 1. Let it be required to lay down a place upon

the

the chart, its latitude, and the difference of longitude between it and some known place upon the chart being given.

Example. Let the known place be the Lizard lying on the parallel of 50° 00' north, and the place to be laid down St Katharines on the east coast of America, differing in longitude from the Lizard 42° 36', lying so much to the westward of it.

Let L represent the Lizard on the chart, (see No. 12.) lying on the parallel of 50° 00' north, its meridian. Set off AE from E upon the equator EQ 42° 36', towards Q, which will reach from E to F. Through F draw the meridian FG, and this will be the meridian of St Katharines; then set off from Q to H upon the graduated meridian QB, 28 degrees; and through H draw the parallel of latitude HM, which will meet the former meridian in K, the place upon the chart required.

Prob. II. Given two places upon the chart, to find their difference of latitude and difference of longitude.

Through the two places draw parallels of latitude; then the distance between these parallels numbered in degrees and minutes upon the graduated meridian will be the difference of latitude required; and through the two places drawing meridians, the distance between these, counted in degrees and minutes on the equator or any graduated parallel, will be the difference of longitude required.

Prob. III To find the bearing of one place from another upon the chart.

Example. Required the bearing of St Katharines at K, (see No. 12.) from the Lizard at L.

Draw the meridian of the Lizard AE, and join K and L with the right line KL; then by the line of chords measuring the angle KLE, and with that entering the tables, we shall have the thing required.

This may also be done, by having compasses drawn on the chart (suppose at two of its corners;) then lay the edge of a ruler over the two places, and let fall a perpendicular, or take the nearest distance from the centre of the compass next the first place, to the ruler's edge; then with this distance in your compasses, slide them along by the ruler's edge, keeping one foot of them close to the ruler, and the other as near as you can judge perpendicular to it, which will describe the rhomb required.

Prob. IV. To find the distance between two given places upon the chart.

This problem admits of four cases, according to the situation of the two places with respect to one another.

Case I. When the given places lie both upon the equator.

In this case their distance is found by converting the degrees of difference of longitude intercepted between them into minutes.

Case II. When the two places lie both on the same meridian.

Draw the parallels of those places; and the degrees upon the graduated meridian, intercepted between those parallels, reduced to minutes, give the distance required.

Case III. When the two places lie on the same parallel

Example. Required to find the distance between the points K and N, (see No. 12.) both lying on the parallel of 28° 00' north. Take from your scale the chord of 60° or radius in your compasses, and with that extent on KN as a base make the isosceles triangle KPN; then take from the line of sines the co-sine of the latitude, or sine of 72° and set that off from P to S and T. Join S and T with the right line ST, and that applied to the graduated equator will give the degrees and minutes upon it equal to the distance; which, converted into minutes, will be the distance required.

The reason of this is evident from the section of *Parallel-Sailing:* for it has been there demonstrated, that radius is to the co-sine of any parallel, as the length of any arch on the equator, to the length of the same arch on that parallel. Now in this chart KN is the distance of the meridians of the two places K and N upon the equator; and since, in the triangle PNK, ST is the parallel to KN, therefore PN:PT::NK:TS. Consequently TS will be the distance of the two places K and N upon the parallel of 28°.

If the parallel the two places lie on be not far from the equator, and they not far asunder; then their distance may be found thus. Take the distance between them in your compasses, and apply that to the graduated meridian, so as the one foot may be as many minutes above, as the other is below the given parallel; and the degrees and minutes intercepted, reduced to minutes, will give the distance.

Or it may also be found thus. Take the length of a degree on the meridian at the given parallel, and turn that over on the parallel from the one place to the other, as oft as you can; then as oft as that extent is contained between the places, so many times 60 miles will be contained in the distance between them.

Case IV. When the places differ both in longitude and latitude.

Example. Suppose it were required to find the distance between the two places *a* and *e* upon the chart. By

Prob. II. Find the difference of latitude between them; and take that in your compasses from the graduated equator, which set off on the meridian of *a*, from *a* to *b*; then through *b* draw *bc* parallel to *de*; and taking *ac* in your compasses, apply it to the graduated equator, and it will shew the degrees and minutes contained in the distance required, which multiplied by 60 will give the miles of distance.

The reason of this is evident from *Art.* 8. of this *Sect.* for it is plain *ad* is the enlarged difference of latitude, and *ab* the proper; consequently *ae* the enlarged distance, and *ac* the proper.

Prob. V. To lay down a place upon the chart, its latitude and bearing from some known place upon the chart being known, or (which is the same) having the course and difference of latitude that a ship has made, to lay down the running of the ship, and find her place upon the chart.

Example. A ship from the Lizard in the latitude of 50° 00' north, sails SSW till she has differed her latitude 36° 40'. Required her place upon the chart.

Count from the Lizard at L. on the graduated meridian downwards (because the course is southerly) 36° 40' to *g*; through

through which draw a parallel of latitude, which will be the parallel the ſhip is in; then from L draw a SSW line *Lf*, cutting the former parallel in *f*, and this will be the ſhip's place upon the chart.

Prob. VI. One latitude, courſe, and diſtance, ſailed, given; to lay down the running of the ſhip, and find her place upon the chart.

Example. Suppoſe a ſhip at *a* in the latitude of 20° 00′ north, ſails north 37° 20′, eaſt 191 miles: Required the ſhip's place upon the chart.

Having drawn the meridian and parallel of the place *a*, ſet off the rhomb line *ae*, making with *ab* an angle of 37° 20'; and upon it ſet off 191 from *a* to *c*; through *c* draw the parallel *cb*; and taking *ab* in your compaſſes, apply it to the graduated equator, and obſerve the number of degrees it contains; then count the ſame number of degrees on the graduated meridian from C to *b*, and through *b* draw the parallel *be*, which will cut *ac* produced in the point *e*, the ſhip's place required.

Prob. VII. Both latitudes and diſtance ſailed, given; to find the ſhip's place upon the chart.

Example. Suppoſe a ſhip ſails from *a*, in the latitude of 20° 00' north, between north and eaſt 191 miles, and is then in the latitude of 45° 00' north: Required the ſhip's place upon the chart.

Draw *de* the parallel of 45°, and ſet off upon the meridian of *a* upwards, *ab* equal to the proper difference of latitude taken from the equator or graduated parallel. Through *b* draw *bc* parallel to *de*; then with 191 in your compaſſes, fixing one foot of them in *a*, with the other croſs *be* in *c*. Join *a* and *c* with the right line *ac;* which produced will meet *de* in *e*, the ſhip's place required.

Prob. VIII. One latitude, courſe and difference of longitude, given; to find the ſhip's place upon the chart.

Example. Suppoſe a ſhip from the Lizard in the latitude of 50° 00' north, ſails SW*b*W; till her difference of longitude is 42° 36': Required the ſhip's place upon the chart.

Having drawn AE the meridian of the Lizard at L, count from E to F upon the equator 42° 36'; and through F draw the meridian EG; then from L draw the SW*b*W line LK, and where this meets FG, as at K, will be the ſhip's place required.

Prob. IX. One latitude, courſe, and departure, given; to find the ſhip's place upon the chart.

Example. Suppoſe a ſhip at *a* in the latitude of 20° 00' north, ſails north 37° 20' eaſt, till ſhe has made of departure 116 miles: Rqeuired the ſhip's place upon the chart.

Having drawn the meridian of *a*, at the diſtance of 116, draw parallel to it the meridian *k l*. Draw the rhomb line *ac*, which will meet *k l* in ſome point *c*; then through *c* draw the parallel *c b*, and *a b* will be the proper difference of latitude, and *b c* the departure. Take *a b* in your compaſſes, and apply it to the equator or graduated parallel; then obſerve the number of degrees it contains, and count ſo many on the graduated meridian from C upwards to *b*. Through *b* draw the parallel *be*, which will meet *a c* produced in ſome point as *e*, which is the ſhip's place upon the chart.

Prob. X. One latitude, diſtance, and departure, given; to find the ſhip's place upon the chart.

Example. Suppoſe a ſhip at *a* in the latitude of 20° 00′ north, ſails 191 miles between north and eaſt, and then is found to have made of departure 116 miles: Required the ſhip's place upon the chart.

Having drawn the meridian and parallel of the place *a*, ſet off upon the parallel *a m* equal to 116, and through *m* draw the meridian *k l*. Take the given diſtance 191 in your compaſſes; ſetting one foot of them in *a*, with the other croſs *k l* in *c*. Join *a c*, and through *c* draw the parallel *c b*; ſo *c b* will be the departure, and *a b* the proper difference of latitude; then proceeding with this, as in the foregoing problem, you will find the ſhip's place to be *e*.

Prob. XI. The latitude ſailed from, difference of latitude, and departure, given; to find the ſhip's place upon the chart.

Example. Suppoſe a ſhip from *a* in the latitude of 20° 00′ north, ſails between north and eaſt, till ſhe be in the latitude of 45° 00′ north, and is then found to have made of departure 116 miles: Required the ſhip's place upon the chart.

Having drawn the meridian of *a*, ſet off upon it, from *a* to *b*, 25 degrees, (taken from the equator or graduated parallel,) the proper difference of latitude; then thro' *b* draw the parallel *b c*, and make *b c* equal to 116 the departure, and join *a c*. Count from the parallel of *a* on the graduated meridian upwards to *b* 25 degrees, and through *b* draw the parallel *b e*, which will meet *ac* produced in ſome point *e*, and this will be the place of the ſhip required.

12. In the ſection of *Plain Sailing* it is plain that the terms *meridional diſtance*, *departure*, and *difference of longitude*, were ſynonymous, conſtantly ſignifying the ſame thing: which evidently followed from the ſuppoſition of the earth's ſurface being projected on a plane, in which the meridians were made parallel, and the degrees of latitude equal to one another and to thoſe of the equator. But ſince it has been demonſtrated (in this ſection) that if, in the projection of the earth's ſurface upon a plane, the meridians be made parallel, the degrees of latitude muſt be unequal, ſtill increaſing the nearer they come to the pole. It follows that theſe terms muſt denote lines really different from one another.

Sect. 6. *Of* Oblique Sailing.

The queſtions that may be propoſed on this head being innumerable, we ſhall only give a few of the moſt uſeful.

Prob. I. Coaſting along the ſhore, I ſaw a cape bear from me NNE; then I ſtood away NW*b*W 20 miles, and I obſerved the ſame cape to bear from me NE*b*E. Required the diſtance of the ſhip from the cape at each ſtation.

Geometrically. Draw the circle NWSE (No. 22.) to repreſent the compaſs, NS the meridian, and WE the eaſt and weſt line, and let C be the place of the ſhip in her firſt ſtation; then from C ſet off upon the NW*b*W line, CA 20 miles, and A will be the place of the ſhip in her ſecond ſtation.

From

From C draw the NNE line CB, and from A draw AB parallel to the NE*b*E line CD, which will meet CB in B the place of the cape, and CB will be the diſtance of it from the ſhip in its firſt ſtation, and AB the diſtance in the ſecond : to find which,

By CALCULATION;

In the triangle ABC are given AC, equal to 20 miles; the angle ACB, equal to 78° 45′, the diſtance between the NNE and NW*b*W lines; alſo the angle ABC, equal to BCD, equal to 33° 45′, the diſtance between the NNE and NB*b*E lines; and conſequently the angle A, equal to 67° 30′.

Hence for CB, the diſtance of the cape from the ſhip in her firſt ſtation, it will be (by oblique trigonometry)

S. ABC : AC :: S. BAC : CB,

i. e. As the ſine of the angle B	33° 45′	9.74473
is to the diſtance run AC —	20 —	1.30103
ſo is the ſine of BAC —	67 , 30	9.96562
to CB — —	33.26	1.52191

the diſtance of the cape from the ſhip at the firſt ſtation.

Then for AB, it will be, by oblique trigonometry,

S. ABC : AC :: S. ACB : AB.

i. e. As the ſine of B —	33°, 45′	9.74474
is to AC — —	20 —	1.30103
ſo is the ſine of C —	78 - 45	9.99157
to AB — —	35.31	1.54786

the diſtance of the ſhip from the cape at her ſecond ſtation.

PROB. II. Coaſting along the ſhore, I ſaw two headlands; the firſt bore from me NE*b*E 17 miles, the other SSW miles. Required the bearing and diſtance of theſe headlands from one another.

GEOMETRICALLY. Having drawn the compaſs NWSE (No. 23.) let C repreſent the place of the ſhip; ſet off upon the NE*b*E line CA 17 miles from C to A, and upon the SSW line CB 20 miles from C to B, and join AB: then A will be the firſt headland, and B the ſecond; alſo AB will be their diſtance, and the angle A will be the bearing from the NE*b*N line: to find which

By CALCULATION;

In the triangle ACB are given, AC 17, CB 20, and the angle ACB equal to 101° 15′, the diſtance between the NE*b*E and SSW lines. Hence (by oblique angular trigonometry) it will be

As the ſum of the ſides AC and CB	37	1.56820
is to their difference —	3	0.47712
ſo is the tang. of $\frac{1}{2}$ the ſum of the angles A and B	39°, 22 $\frac{1}{2}$	9.91417
to the tang. of half their diff.	3 , 49	8.82309

conſequently the angle A will be 43° 11′, and the angle B 35° 34′; alſo the bearing of B from A will be S*b*W 1° 49 weſterly, and the bearing of A from B will be N*b*E 1° 49′ eaſterly.

Then for the diſtance AB, it will be, by oblique-angular trigonometry,

S. A : CB :: S. C : AB.

i. e. As the ſine of A	43°, 11′	9.83527
is to CB —	20 —	1.30103
ſo is the ſine of C —	101, 15 —	9.99157
to AB — —	28.67 —	1.45733

the diſtance between the two headlands.

PROB. III. Coaſting along the ſhore, I ſaw two headlands; the firſt bore from me NW*b*N, and the ſecond NNE; then ſtanding away E*b*N $\frac{1}{4}$ northerly 20 miles; I found the firſt bore from me WNW $\frac{1}{2}$ weſterly, and the ſecond N*b*W $\frac{1}{2}$ weſterly. Required the bearing and diſtance of theſe two headlands.

GEOMETRICALLY. Having drawn the compaſs NWSE (No. 24.) let C repreſent the firſt place of the ſhip; from which draw the NW*b*N line CB, and the NNE line CD, alſo the E*b*N $\frac{3}{4}$ N line CA, which make equal to 20. From A draw AB parallel to the WNW $\frac{1}{2}$ W line, and AD parallel to the N*b*W $\frac{1}{2}$ W meeting the two firſt lines in the points B and D; then B will be the firſt and D the ſecond headlands. Join the points B and D, and BD will be the diſtance between them, and the angle CDB the bearing from the NNE line: to find which

By CALCULATION;

1. In the triangle ABC are given the angle BCA, equal to 104° 04′, the diſtance between the NW*b*N line, and the ENE$\frac{1}{4}$E line; the angle BAC, equal to 36° 34′, the diſtance between the WSW$\frac{1}{4}$W line and the WNW $\frac{1}{2}$W line; the angle ABC equal to 39° 22′, the diſtance between the ESE$\frac{1}{4}$E line; and the SW*b*S line, alſo the ſide CA equal to 20 miles; whence for CB, it will be (by oblique trigonometry)

As the ſine of CBA —	39°, 22′ —	9.80228
is to AC — —	20 —	1.30103
ſo is the ſine of CAB —	36°, 34′ —	9.77507
to CB — —	18.79 —	1.27382

the diſtance between the firſt headland and the ſhip in her firſt ſtation.

2. In the triangle ACD, are given the angle ACD, equal to 47° 49′, the diſtance between the ENE$\frac{1}{4}$E line, and the NNE line; the angle CAD, equal to 92° 49′, the diſtance between the WSW$\frac{1}{4}$W line; and the N*b*W$\frac{1}{2}$ W line, the angle CDA equal to 39° 22′, the diſtance between the SSW line and the S*b*E$\frac{1}{2}$E line; alſo the leg CA equal to 20.

Hence for CD, it will be (by oblique trigonometry)

As the ſine CAD —	39°, 22′ —	9 80228
is to AC — —	20 —	1.30103
ſo is the ſine of CAD —	92°, 34′ —	9.99960
to CD — —	31.5 —	1.49835

the diſtance between the ſecond headland and the ſhip in her firſt ſtation.

3. In the triangle BCD are given BC 18.79, CD 31.5, and the angle BCD equal to 56° 15′, the diſtance between the NW*b*N line and the NNE line.

Hence for the angle CDB, it will be (by oblique trigonometry)

As the ſum of the ſides —	50.29 —	1.70148
is to the difference of ſides	12.71 —	1.10415
ſo is tangent of $\frac{1}{2}$ ſum of the unknown angles	— 61°, 51′ —	10.27189
to tang. of half their diff.	25 , 18 —	9.67458

conſequently the angle CBD is 87° 10′, and the angle CDB 36° 35′. Hence the bearing of the firſt headland from the ſecond will be S 59° 8′, W or SW*b*W$\frac{1}{2}$W nearly; and for the diſtance between them, it will be,

As the ſine of BDC —	36°, 35′ —	9.77524
is to BC — —	18.79 —	1.27382

ſo

so is the sine of BCD — 56°, 15′ — 9.91985
to BD — — 26.21 — 1.41843
the distance between the two headlands.

This, and the first problem, are of great use in drawing the plot of any harbour, or laying down any sea coast.

Suppose a ship that makes her way good within 6 ½ points of the wind, at north, is bound to a port bearing east 86 miles distance from her: Required the course and distance upon each tack, to gain the intended port.

Geometrically. Having drawn the compass NE SW, (No. 25.) let C represent the ship's place, and set off upon the east line CA 86 miles, so A will be the intended port. Draw CD and CB on each side of the north line at 6 ½ points distance from it, and through A draw AB parallel to CD meeting CB in B; then the ENE ½ E line CB, will be the course of the ship upon the starboard tack, and CB its distance on that tack; also the ESE ½ E line Ab, will be the course on the larboard tack, and BA the distance on that tack: to find which

By Calculation;

In the triangle ABC are given, the angle ACB, equal to 16°, 53′, the distance between the east and ENE ½ E line; the angle CBA, equal to 146° 14′, the distance between the ENE ½ E and the WNW ½ W lines; the angle BAC equal to 16° 53′, the distance between the east and ESE ½ E lines; also AC 86 miles.

Hence since the angle at A and C are equal, the legs CB and BA will likewise be equal; to find either of which (suppose CB) it will be (by oblique angled trigonometry.)

As the sine of B —	146°, 14′ —	9.74493
is to AC —	86 —	1.93450
so is the sine of A —	16, 53 —	9.46303
to CB —	44.94 —	1.65260

the distance the ship must sail on each tack.

There is a great variety of useful questions of this nature that may be proposed; but the nature of them being better understood by practice at sea, we shall leave them, and go on to *Current Sailing*.

Sect. 7. *Concerning* Currents, *and how to make proper allowances*.

1. Currents are certain settings of the *stream*, by which all bodies (as ships, *&c.*) moving therein, are compelled to alter their course or velocity, or both; and submit to the motion impressed upon them by the current.

Case I. If the current sets just with the course of the ship, (*i. e.*) moves on the same rhomb with it; then the motion of the ship is increased, by as much as is the drift or velocity of the current.

Example. Suppose a ship sails SE*b*S at the rate of 6 miles an hour, in a current that sets SE*b*S 2 miles an hour: Required her true rate of sailing.

Here it is evident that the ship's true rate of sailing will be 8 miles an hour.

Case II. If the current sets directly against the ship's course, then the motion of the ship is lessened by as much as is the velocity of the current.

Example. Suppose a ship sails SSW at the rate of 10 miles an hour, in a current that sets NNE 6 miles an hour. Required the ship's true rate of sailing.

Here it is evident that the ship's true rate of sailing will be 4 miles an hour. Hence it is plain,

Cor. I. If the velocity of the current be less than the velocity of the ship, then the ship will get so much ahead as is the difference of these velocities.

Cor. II. If the velocity of the current be greater than that of the ship, then the ship will fall so much a stern as is the difference of these velocities.

Cor. III. Lastly, If the velocity of the current be equal to that of the ship, then the ship will stand still; the one velocity destroying the other.

Case III. If the current thwarts the course of the ship, then it not only lessens or augments her velocity, but gives her a new direction compounded of the course she steers, and the setting of the current, as is manifest from the following

Lemma. If a body at A (No. 26.) be impelled by two forces at the same time, the one in the direction AB capable to carry that body from A to B in a certain space of time, and the other in the direction AD capable to carry it from A to D in the same time; complete the parallelogram ABCD, and draw the diagonal AC; then the body at A agitated by these two forces together, will move along the line BC, and will be in the point C at the end of the time in which it would have moved along AD or AB with the forces separately applied.

Hence the solution of the following examples will be evident.

Example I. Suppose a ship sails (by the compass) directly south 96 miles in 24 hours, in a current that sets east 45 miles in the same time. Required the ship's true course and distance.

Geometrically. Draw AD (see No. 26.) to represent the south and north line of the ship at A, which make equal to 96; from D draw DC perpendicular to AD, equal to 45; and join AC. Then C will be the ship's true place, AC her true distance, and the angle CAD the true course. To find which

By Calculation:

First, For the true course DAC, it will be, (by rectangular trigonometry,)

As the apparent distance AD	— 96 —		1.98227
is to the current's motion DC	— 45 —		1.65321
so is radius	— —	—	10.00000
to the tangent of the true course DAC —	— 25°, 07′		9.67094

consequently the ship's true course is S 25° 07′ E, or SSE 2° 37′, easterly.

Then for the true distance AC, it will be, (by rectangular trigonometry,)

As the sine of the course A —	25°, 07′	9.62784
is to the departure DC —	45 —	1.65321
so is radius — —	—	10.00000
to the true distance AC —	106 —	2.02537

Example. Suppose a ship sails SE 120 miles in 20 hours, in a current that sets W*b*N at the rate of 2 miles an hour: Required the ship's true course and distance sailed in that time.

Geome-

GEOMETRICALLY. Having drawn the compaſs NESW (No 27.) let C repreſent the place the ſhip ſailed from; draw the SE line CA, which make equal to 120; then will A be the place the ſhip caped at.

From A draw AB parallel to the W*b*N line CD, equal to 40, the motion of the current in 20 hours, and join CB; then B will be the ſhip's true place at the end of 20 hours, CB her true diſtance, and the angle SCB her true courſe. To find which

By CALCULATION;

In the triangle ABC, are given CA 120, AB 40, and the angle CAB equal to 34° 45', the diſtance between the E*b*S and SE lines, to find the angles B and C, and the ſide CB.

Firſt, For the angles C and B, it will be, (by oblique trigonometry)

As the ſum of the ſides CA and AB	160 —	2.20412
is to their difference ——	80 —	1.90309
ſo is the tang. of half the ſum of the angles B and C —	73°, 07'	10.51783
to the tang. of half their diff. —	59 , 45	10.21680

conſequently the angle B will be 131 , 52, and the angle ACB 14° 23'. Hence the true courſe is S 30°, 37' E, or SSE 2° 07' eaſterly.

Then for the true diſtance CB, it will be, (by oblique trigonometry)

As the ſine of B ——	131°, 52' —	9.87198
is to AC —— ——	120 ——	2.07918
ſo is the ſine of A ——	33°, 45' —	9.74474
to the true diſtance CB ——	89.53 —	1.95194

EXAMPLE III. Suppoſe a ſhip coming out from ſea in the night, has ſight of Scilly light, bearing NE*b*N diſtance 4 leagues, it being then flood tide ſetting ENE 2 miles an hour, and the ſhip running after the rate of 5 miles an hour. Required upon what courſe and how far ſhe muſt ſail to hit the Lizard, which bears from Scilly E½S diſtance 17 leagues.

GEOMETRICALLY. Having drawn the compaſs NESW (No. 28.) let A repreſent the ſhip's place at ſea, and draw the NE*b*N line AS, which make equal to 12 miles, ſo S will repreſent Scilly.

From S draw SL equal to 51 miles, and parallel to the E½S line; then L will repreſent the Lizard.

From L draw LC parallel to the ENE line, equal to 2 miles, and from C draw CD equal to 5 miles meeting AL in D; then from A draw AB parallel to CD meeting LC produced in B; and AB will be the required diſtance, and SAB the true courſe. To find which

By CALCULATION;

In the triangle ASL are given the ſide AS equal to 12 miles, the ſide SL equal to 51, and the angle ASL equal to 118° 07', the diſtance between the NE*b*N and W½N lines; to find the angles SAL and SLA. Conſequently, (by oblique trigonometry,) it will be,

As the ſum of the ſides AS and SL —	63	1.79934
is to their difference —— —	39	1.59106
ſo is the tang. of half the ſum of the angles SAL and SLA	30°, 56'	9.77763
to the tang. of half their diff. —	20°, 21'	9.56935

conſequently the angle SAL, will be 51° 17', and ſo the direct bearing of the Lizard from the ſhip will be N 85° 02' E, or E*b*N 6° 17' E; and for the diſtance AL, it will be (by oblique trigonometry,)

As the ſine of SAL —	51°, 17' —	9.89223
is to SL —— ——	51 —	1.70757
ſo is the ſine of ASL —	118°, 07' —	9.94546
to AL —— ——	57.65 ——	1.76080

the diſtance between the ſhip and the Lizard.

Again, in the triangle DLC, are given the angle L equal to 17° 32', the diſtance between the ENE and N 85° 02' E lines; the ſide LC, equal to 2 miles, the current's drift in an hour; and the ſide CD, equal to 5 miles, the ſhip's run in the ſame time. Hence for the angle D, it will be (by oblique trigonometry,)

As the ſhip's run in 1 hour DC —	5 —	0.69897
is to the ſine of L ——	17°, 32' —	9.47894
ſo is the current's drift LC —	2 —	0.30103
to the ſine of D —— ——	6°, 55' —	9.08100

conſequently ſince by conſtruction the angle LAB is equal to the angle LDC, the courſe the ſhip muſt ſteer is S 88° 03' E.

Then for the diſtance AB, it will be (by oblique trigonometry,)

As the ſine of B —— ——	155°, 33' —	9.61689
is to AL —— ——	57.65 ——	1.76080
ſo is the ſine of L ——	17.32 ——	9.47894
to AB —— ——	41.96 ——	1.62285

conſequently, ſince the ſhip is ſailing at the rate of 5 miles an hour, it follows, that in ſailing $8^h\ 24^m$ S 88° 03' E, ſhe will arrive at the Lizard.

EXAMPLE IV. A ſhip from a certain headland in the latitude of 34° 00' north, ſails SE*b*S 12 miles in three hours, in a current that ſets between north and eaſt; and then the ſame headland is found to bear WNW, and the ſhip to be in the latitude of 33° 52' north. Required the ſetting and drift of the current.

GEOMETRICALLY. Having drawn the compaſs NESW (No. 29.) let A repreſent the place of the ſhip, and draw the SE*b*S line AB equal to 12 miles, alſo the ESE line AC.

Set off from A upon the meridian AD, equal to 8 miles, the difference of latitude, and through D draw DC parallel to the eaſt and weſt line WE, meeting AC in C. Join C and B with the right line BC; then C will be the ſhip's place, the angle ABC the ſetting of the current from the SE*b*S line, and the line BC will be the drift of the current in 3 hours. To find which

By CALCULATION:

In the triangle ADC right angled at D, are given the difference of latitude AD equal to 8 miles, the angle DAC equal to 67° 30'. Whence for AC, the diſtance the ſhip has ſailed, it will be

As radius —— —— ——		10.00000
is to the diff. of latitude AD —	8 —	0.90309
ſo is the ſecant of the courſe DAC — —	— 67°, 30'	10.41716
to the diſtance run AC ——	20.9 —	1.32025

Again, in the triangle ABC, are given AB equal to

12 miles, AC equal to 20.9; and the angle BAC equal to 33° 45', the diſtance between the SE*b*S and ESE lines. Whence for the angle at B, it will be,

As the ſum of the ſides AC and AB	32.9	1.51720
is to their difference	8.9	0.94930
ſo is the tang. of half the ſum of the angles B and C	73°, 07'	10.51806
to tang. of ½ their diff.	41°, 43' ½	9.95025

conſequently the angle B is 114° 51', and ſo the ſetting of the current will be N 81° 06' E or E*b*E 2° 21' E. Then for BC the current's drift in 3 hours, it will be,

As the ſine of B	114°, 51'	9.92700
is to the diſtance run AC	20.9	1.32025
ſo is the ſine of A	33°, 45'	9.74474
to BC	12.8	1.10719

the current's drift in 3 hours, and conſequently the current ſets E*b*N 2° 21' E 4.266 miles an hour.

Sect. 8. *Concerning the* VARIATION *of the* COMPASS, *and how to find it from the true and obſerved* AMPLITUDES *or* AZIMUTHS *of the ſun.*

1. THE variation of the compaſs is how far the north or ſouth point of the needle ſtands from the true ſouth or north point of the horizon towards the eaſt or weſt; or it is an arch of the horizon intercepted between the meridian of the place of obſervation and the magnetic meridian.

2. It is abſolutely neceſſary to know the variation of the compaſs at ſea, in order to correct the ſhip's courſe; for ſince the ſhip's courſe is directed by the compaſs, it is evident that if the compaſs be wrong the true courſe will differ from the obſerved, and conſequently the whole reckoning differ from the truth.

3. The ſun's true amplitude is an arch of the horizon comprehended between the true eaſt or weſt point thereof, and the centre of the ſun at riſing or ſetting; or it is the number of degrees, *&c.* that the centre of the ſun is diſtant from the true eaſt or weſt point of the horizon, towards the ſouth or north.

4. The ſun's magnetic amplitude is the number of degrees that the centre of the ſun is from the eaſt or weſt point of the compaſs, towards the ſouth or north point of the ſame at riſing or ſetting.

5. Having the declination of the ſun, together with the latitude of the place of obſervation, we may from thence find the ſun's true amplitude, by the following aſtronomic propoſition, *viz.*

As the co-ſine of the latitude
is to the radius
So is the ſine of the ſun's declination
to the ſine of the ſun's true amplitude
which will be north or ſouth according as the ſun's declination is north or ſouth.

EXAMPLE. Required the ſun's true amplitude in the latitude of 41° 50' north, on the 23d day of April 1731.

Firſt, I find (from the tables of the ſun's declination) that the ſun's declination the 23d of April is 15° 54' north; then for the true amplitude, it will be, by the former analogy.

As the co ſine of the lat.	41° 50'	9.87221
is to radius		10.00000
ſo is the ſine of the decl.	15°, 54',	9.43760
to the ſine of the amplit.	21, 35,	9.56548

which is north, becauſe the declination is north at that time; and conſequently, in the latitude of 41° 50' north, the ſun riſes on the 23d of April 21° 35' from the eaſt part of the horizon towards the north, and ſets ſo much from the weſt the ſame way.

6. The ſun's true azimuth is the arch of the horizon intercepted between the meridian and the vertical circle paſſing through the centre of the ſun at the time of obſervation.

7. The ſun's magnetic azimuth is the arch of the horizon intercepted between the magnetic meridian and the vertical, paſſing through the ſun.

8. Having the latitude of the place of obſervation, together with the ſun's declination and altitude at the time of obſervation, we may find his true azimuth after the following method, *viz.*

Make it,
As the tangent of half the complement of the latitude is to the tangent of half the ſum of the diſtance of the ſun from the pole and complement of the altitude
So is the tangent of half the difference between the diſtance of the ſun from the pole and complement of the altitude
To the tangent of a fourth arch
which fourth arch added to half the complement of the latitude will give a fifth arch, and this fifth arch leſſened by the complement of the latitude will give a ſixth arch.
Then make it
As the radius
is to the tangent of the altitude
ſo is the tangent of the ſixth arch
to the co ſine of the ſun's azimuth
which is to be counted from the ſouth or north, to the eaſt or weſt, according as the ſun is ſituated with reſpect to the place of obſervation.

If the latitude of the place and declination of the ſun be both north or both ſouth, then the declination taken from 90° will give the ſun's diſtance from the pole; but if the latitude and declination be on contrary ſides of the equator, then the declination added to 90° will give the ſun's diſtance from the neareſt pole to the place of obſervation.

EXAMPLE. In the latitude of 51° 32' north, the ſun having 19° 39' north declination, his altitude was found by obſervation to be 38° 18: Required the azimuth.

By the firſt of the foregoing analogies, it will be

As the tangent of ½ the complement of the latitude	19°, 14'	9.54269
is to the tagent of ½ the ſum of the diſtance of the ſun from the pole and complement of the altitude	61,, 01	10.25655
ſo is the tangent of half their difference	9,, 19	7.21499
to the tang. of a 4th arch	40,, 20	9.92885

which fourth arch 40° 20', added to 19° 14' half the complement of the latitude, give a fifth arch 59° 34'; and this fifth arch leſſened by 38° 28', the complement of the latitude, gives the ſixth arch 21° 06'; then for the

the azimuth, it will be, by the second of the preceding analogies,

As radius —— —— 10.00000
is to the tang. of the altitude 38°, 18′ 9.89749
so is the tang. of the sixth arch 21 ,, 06 — 9.58644
to the co-sine of the azimuth 72 ,, 15 — 9.48393

which, because the latitude is north and the sun south of the place of observation, must be counted from the south towards the east or west; and consequently, if the altitud of the sun was taken in the morning, the azimuth will be S 72° 15′ E, or ESE 4° 45′ E; but if the altitude was taken in the afternoon, the azimuth will be S 72° 15′ W, or WSW 4° 45′ westerly.

9. Having found the sun's true amplitude or azimuth by the preceding analogies, and his magnetic amplitude or azimuth by observation, it is evident, if they agree, there is no variation; but if they disagree, then if the true and observed amplitudes at the rising or setting of the sun be both of the same name, *i. e.* either both north, or both south, their difference is the variation; but if they be of different names, *i. e.* one north and the other south, their sum is the variation. Again, if the true and observed azimuth be both of the same name, *i. e.* either both east or both west, their difference is the variation; but if they be of different names, their sum is the variation: And to know whether the variation is easterly, observe this general rule, *viz.*

Let the observer's face be turned to the sun: then if the true amplitude or azimuth be to the right hand of the observed, the variation is easterly; but if it be to the left, westerly.

To explain which, let NESW (No. 30.) represent a compass, and suppose the sun is really E*b*S at the time of observation, but the observer sees him off the east point of the compass, and so the true amplitude or azimuth of the sun is to the right of the magnetic or observed; here it is evident that the E*b*S point of the compass ought to lie where the east point is, and so the north where the N*b*W is; consequently the north point of the compass is a point too far east, *i. e.* the variation in this case is easterly. The same will hold when the amplitude or azimuth is taken on the west side of the meridian.

Again, let the true amplitude or azimuth be to the left hand of the observed. Thus, suppose the sun is really E*b*N at the time of observation, but the observer sees him off the east point of the compass, and so the true amplitude or azimuth to the left of the observed: Here it is evident that the E*b*N point of the compass ought to stand where the east point is, and so the north where the N*b*E point is; consequently the north point of the compass lies a point too far westerly, so in this case the variation is west. The same will hold when the sun is observed on the west side of the meridian.

EXAMPLE I. Suppose the sun's true amplitude at rising is found to be E 14° 20′ N, but by the compass it is found to be E 26° 12′: Required the variation, and which way it is.

Since they are both the same way, therefore

From the magnetic amplitude —— E 26°, 12′ N.
take the true amplitude — — E 14 , 20 N.

and there remains the variation —— 11 , 52 E.

which is easterly, because in this case the true amplitude is the right of the observed.

EXAMPLE II. Suppose the sun's true amplitude at setting is W 34° 26′ S, and his magnetic amplitude W 23° 13′ S: Required the variation, and which way it is.

Since they lie both the same way, therefore

From the sun's true amplitude — W 34°, 26′ S.
take his magnetic amplitude — W 23 , 13 S.

there remains the variation — 11 , 13 W.

which is westerly, because the true amplitude, in this case, is to the left hand of the observed.

EXAMPLE III. Suppose the sun's true altitude at rising is found to be 13° 24′ N, and his magnetic E 12° 32′ S: Required the variation, and which way it lies.

Since the true and observed amplitudes lie different ways, therefore

To the true amplitude — E 13°, 24′ N.
add the magnetic amplitude — E 12 , 32 S.

the sum is the variation — 25 , 56 W.

which is westerly, because the true amplitude is, in this case, to the left of the observed.

EXAMPLE IV. Suppose the sun's true altitude at setting is found to be W 8° 24′ N, but his magnetic amplitude is W 10° 13′ S: Required the variation.

To the true amplitude — W 8°, 24′ N.
add the magnetic — — W 10 , 13 S.

the sum is the variation —— 18 , 37 E.

which is easterly, because the true amplitude is to the right of the observed.

EXAMPLE V. Suppose the sun's true azimuth at the time of observation, is found to be N 86° 40′ E, but by the compass it is N 73° 24′ E: Required the variation, and which way it lies.

From the sun's true azimuth, — N 86°, 40′ E.
take the magnetical, — N 73 , 24 E.

there remains the variation, —— 13 , 16 E.

which is easterly, because the true azimuth is to the right of the observed.

EXAMPLE VI. Suppose the sun's true azimuth is S 3° 24′ E. and the magnetical S 4° 36′ W: Required the variation, and which way it lies.

To the true azimuth —— —— S 3°, 24′ E.
add the magnetical azimuth —— S 4 , 36 W.

the sum is the variation —— 8 , 00 W.

which is westerly, because the true azimuth is, in this case, to the left of the observed.

10. The variation of the compass was first observed at London, in the year 1580, to be 11° 15′ easterly, and in the year 1622 it was 6° 0′ E; also in the year 1634, it was 4° 05′ E, still decreasing, and the needle approaching the true meridian, till it coincided with it, and then there was no variation; after which, the variation

tion began to be westerly; and in the year 1672, it was observed to be 2° 30' W; also in the year 1683, it was 4° 30' W; and since that time the variation still continues at London to increase westerly; but how far it will go that way, time and observations will probably be the only means to discover.

Again, at Paris, in the year 1640, the variation was 3° 00' E; and in the year 1666, there was no variation; but in the year 1681, it was 2° 30' W, and still continues to go westerly.

In short, from observations made in different parts of the world, it appears, that in different places the variation differs both as to its quantity and denomination, it being east in one place, and west in another; the true cause and theory of which, for want of a sufficient number of observations, has not as yet been fully explained.

Sect 9. *The* METHOD *of keeping a* JOURNAL *at sea; and how to correct it, by making proper allowances for the* leeway, variation, *&c.*

1. LEE-WAY is the angle that the rhom bline, upon which the ship endeavours to sail, makes with the rhomb she really sails upon. This is occasioned by the force of the wind or surge of the sea, when she lies to the windward, or is close hauled, which causes her to fall off and glide side-ways from the point of the compass she capes at. Thus let NESW (No. 31.) represent the compass; and suppose a ship at C capes at, or endeavours to sail upon, the rhomb C*a*; but by the force of the wind, and surge of the sea, she is obliged to fall off, and make her way good upon the rhomb C*b*; then the angle *a*C*b* is the lee-way; and if that angle be equal to one point, the ship is said to make one point lee way; and if equal to two points, the ship is said to make two points lee way, *&c.*

2. The quantity of this angle is very uncertain, because some ships, with the same quantity of sail, and with the same gale, will make more lee-way than others; it depending much upon the mould and trim of the ship, and the quantity of water that she draws. The common allowances that are generally made for the lee-way, are as follow.

1. If a ship be close hauled, has all her sails set, the water smooth, and a moderate gale of wind, she is then supposed to make little or no lee-way.

2. If it blow so fresh as to cause the small sails be handed, it is usual to allow one point.

3. If it blow so hard that the top sails must be close reeft, then the common allowance is two points for lee-way.

4. If one top sail must be handed, then the ship is supposed to make between two and three points lee way.

5. When both top-sails must be handed, then the allowance is about four points for lee-way.

6. If blows so hard, as to occasion the fore-course to be handed, the allowance is between 5½ and 6 points.

7. When both main and fore-courses must be handed, then 6 or 6½ points are commonly allowed for lee-way.

8. When the mizen is handed, and the ship is trying a hull, she is then commonly allowed about 7 points for lee-way.

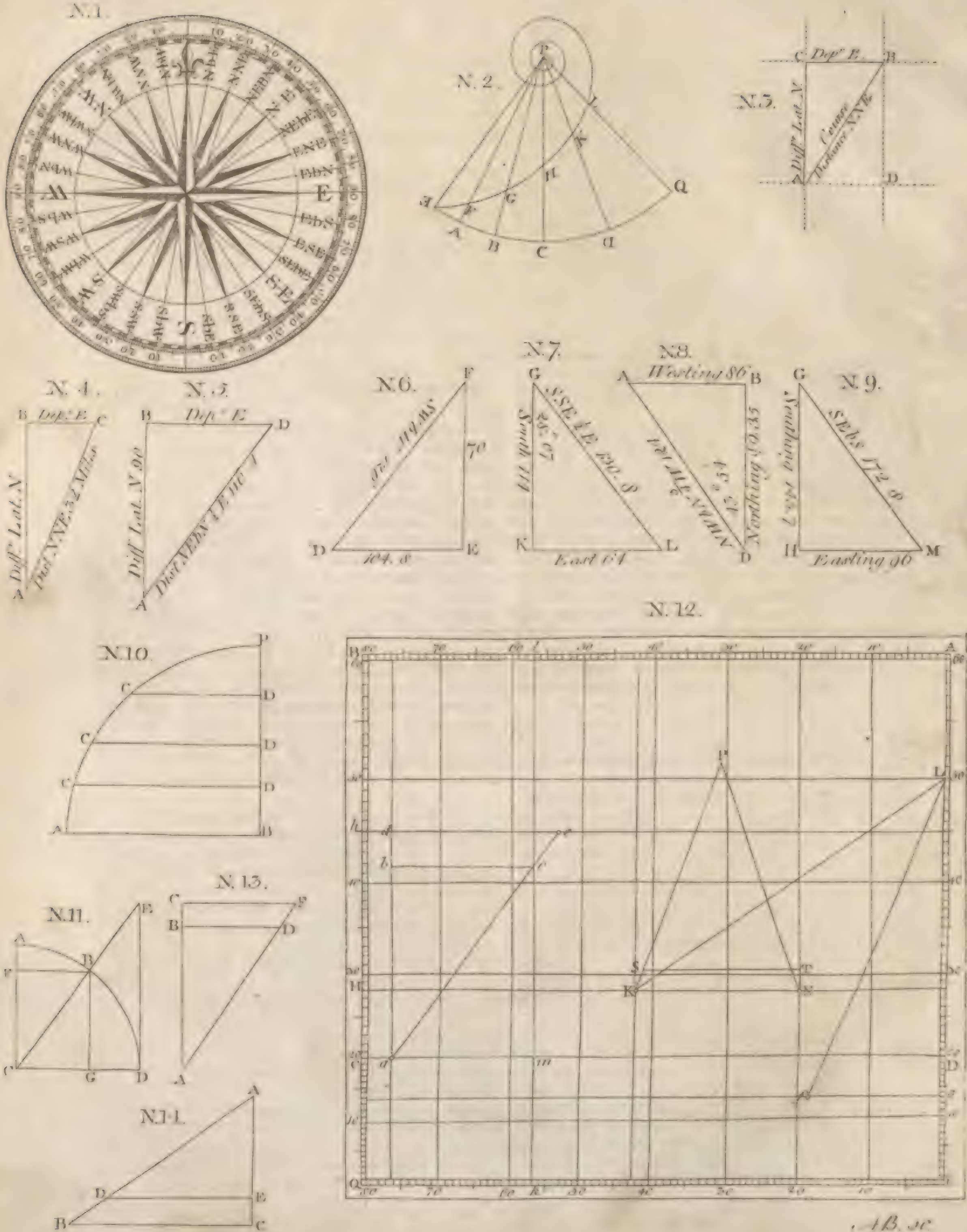
3. Though these rules are such as are generally made use of, yet since the lee-way depends much upon the mould and trim of the ship, it is evident that they cannot exactly serve to every ship; and therefore the best way is to find it by observation: Thus, let the ship's wake be set by a compass in the poop, and the opposite rumb is the true course made good by the ship; then the difference between this and the course given by the compass in the bittacle, is the lee-way required. If the ship be within sight of land; then the lee-way may be exactly found by observing a point on the land which continues to bear the same way, and the distance between the point of the compass it lies upon and the point the ship capes at will be the lee-way. Thus suppose a ship at C, is lying up NW*b*, towards A; but instead of keeping that course, she is carried on the NNE line CB, and consequently the point B continues to bear the same way from the ship: Here it is evident that the angle ACB, or the distance between the N*b*W line that the ship capes at, and the NNE line that the ship really sails upon, will be the lee-way.

4. Having the course steered, and the lee-way, given; we may from thence find the true course by the following method, *viz.* Let your face be turned directly to the windward; and if the ship have her larboard tacks on board, count the lee way from the course steered towards the right hand; but if the starboard tacks be on board, then count it from the course steered towards the left hand. Thus, suppose the wind at north, and the ship lies up within 6 points of the wind, with her larboard tacks on board, making one point lee-way; here it is plain, that the course steered is ENE, and the true course E*b*N; also suppose the wind is at NNW, and the ship lies up within 6½ points of the wind with her starboard tack on board, making 1½ point lee way; it is evident that the true course, in this case, is WSW.

5. We have shewed, in the last section, how to find the variation of the compass; and from what has been said there, we have this general rule for finding the ship's true course, having the course steered and the variation given, *viz.* Let your face be turned towards the point of the compass upon which the ship is steered; and if the variation be easterly, count the quantity of it from the course steered towards the right hand; but if westerly, towards the left hand; and the course thus found is the true course steered. Thus, suppose the course steered is N*b*E, and the variation one point easterly; then the true course steered will be NNE: Also suppose the course steered is NE*b*E, and the variation one point westerly; then in this case, the true course will be NE; and so of others.

Hence, by knowing the lee-way variation, and course steered, we may from thence find the ship's true course; but if there be a current under foot, then that must be tried, and proper allowances made for it, as has been shown in the section concerning *Currents*, from thence to find the true course.

6. After making all the proper allowances for finding the ship's true course, and making as just an estimate of the distance as we can; yet by reason of the many accidents that attend a ship in a day's running, such as different rates of sailing between the times of heaving the log, the


N.1.
N.2.
N.3.
Dep^r. E.
Diff^r. Lat. N.
Course
Distance N.N.E.
N. 4.
N. 5.
Dist. N.N.E. 32 Miles
Dist. N.E.b.N. 1/2 E. 110 1/2
Diff^r. Lat. N. 90
N.6.
S.W.b.W. 126
104. 8
70
N.7.
S.S.E. 1/2 E. 130. 8
South 111
East 64
N.8.
Westing 86
N.N.W. 3/4 W. 124
Northing 90.53
N. 9.
S.E.b.S. 172. 8
Southing 143.7
Easting 96
N.10.
N.11.
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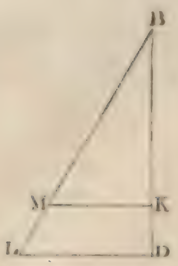
N.14.
N.12.
A.B. sc

N. 15.



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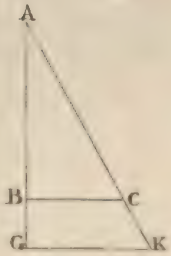

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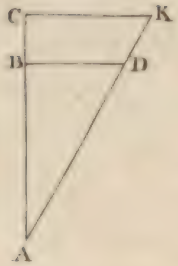

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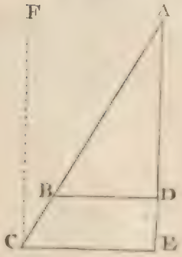

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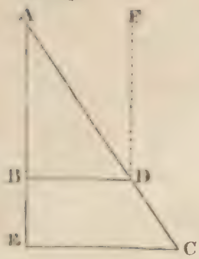

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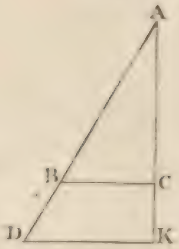

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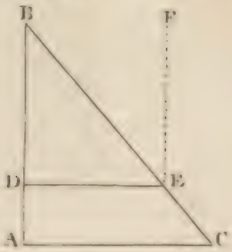

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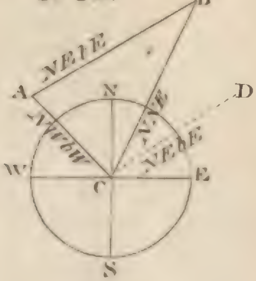

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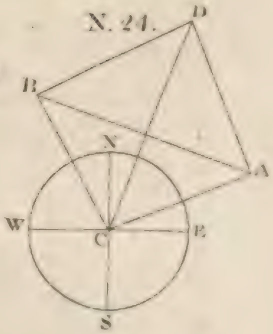

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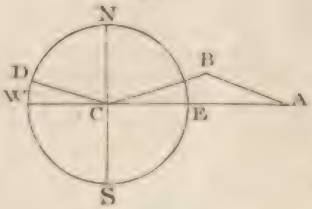

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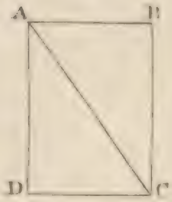

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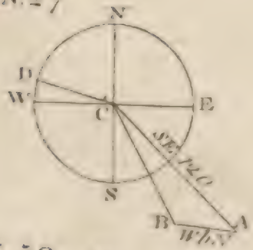

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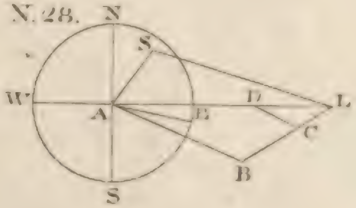

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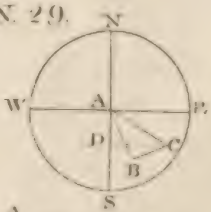

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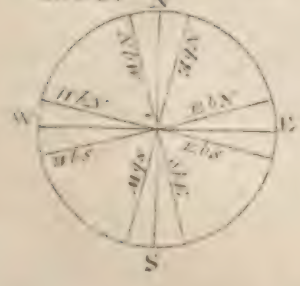

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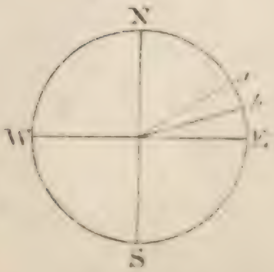

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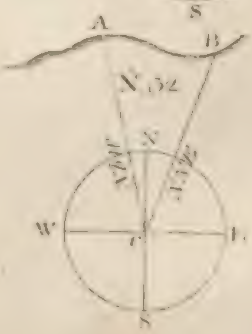

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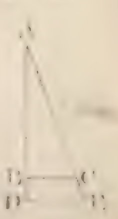


the want of due care at the helm by not keeping her ſteady, but ſuffering her to yaw and fall off; ſudden ſtorms, when no account can be kept, *&c.*; the latitude by account frequently differs from the latitude by obſervation; and when that happens, it is evident there muſt be ſome error in the reckoning; to diſcover which, and where it lies, and alſo how to correct the reckoning, you may obſerve the following rules.

1ſt, If the ſhip ſail near the meridian, or within 2 or $2\frac{1}{2}$ points thereof; then if the latitude by account diſagrees with the latitude by obſervation, it is moſt likely that the error lies in the diſtance run; for it is plain that in this caſe it will require a very ſenſible error in the courſe to make any conſiderable error in the difference of latitude, which cannot well happen if due care be taken at the helm, and proper allowances be made for the lee-way, variation, and currents. Conſequently if the courſe be pretty near the truth, and the error in the diſtance run regularly through the whole, we may, from the latitude obtained by obſervation, correct the diſtance and departure by account, by the following analogies, *viz.*

As the difference of latitude by account
is to the true difference of latitude,
ſo is the departure by account
to the true departure,
and ſo is the direct diſtance by account
to the true direct diſtance.

The reaſon of this is plain: for let AB (No. 33.) denote the meridian of the ſhip at A, and ſuppoſe the ſhip ſails upon the rhomb AE near the meridian, till by account ſhe is found in C, and conſequently her difference of latitude by account is AB; but by obſervation ſhe is found in the parallel ED, and ſo her true difference of latitude is AD, her true diſtance AE, and her true departure DE; then ſince the triangles ABC ADE are ſimilar, it will be AB : AD :: BC : DE, and AB : AD :: AC : AE.

Example. Suppoſe a ſhip from the latitude of 45° 20' north, after having ſailed upon ſeveral courſes near the meridian for 24 hours, her difference of latitude is computed to be upon the whole 95 miles ſoutherly, and her departure 34 miles eaſterly; but by obſervation ſhe is found to be in the latitude of 43° 10' north, and conſequently her true difference of latitude is 130 miles ſoutherly; then for the true departure, it will be, As the difference of latitude by account 95 is to the true difference of latitude 130, ſo is the departure by account 34 to the true departure 46.52, and ſo is the diſtance by account 100.9 to the true diſtance 138.

2dly, If the courſes are for the moſt part near the parallel of eaſt and weſt, and the direct courſe be within $5\frac{1}{2}$ or 6 points of the meridian; then if the latitude by account differs from the obſerved latitude, it is moſt probable that the error lies in the courſe, or diſtance, or perhaps both; for in this caſe it is evident, the departure by account will be very nearly true; and thence by the help of this, and the true difference of latitude, may the true courſe and direct diſtance be readily found by *Caſe* 4. *of Plain Sailing*.

Example. Suppoſe a ſhip from the latitude of 43° 50' north, after having ſailed upon ſeveral courſes near the parallel of eaſt and weſt, for the ſpace of 24 hours, is found by dead reckoning to be in the latitude of 42° 45' north, and to have made 160 miles of weſting; but by a good obſervation the ſhip is found to be in the latitude of 42° 35' north: Required the true courſe, and direct diſtance ſailed.

With the true difference of latitude 75 miles, and departure 160 miles, we ſhall find (by *Caſe* 4. *of Plain Sailing*) the true courſe to be S 64° 53' W, and the direct diſtance 176.7 miles.

3dly, If the courſes are for the moſt part near the middle of the quadrant, and the direct courſe within 2 and 6 points of the meridian; then the error may be either in the courſe, or in the diſtance, or in both, which will cauſe an error both in the difference of latitude and departure; to correct which, having found the true difference of latitude by obſervation, with this, and the direct diſtance by dead reckoning, find a new departure (by *Caſe* 3. *of Plain Sailing*;) then half the ſum of this departure, and that by dead reckoning, will be nearly equal to the true departure; and conſequently with this, and the true difference of latitude, we may (by *Caſe* 4. *of Plain Sailing*) find the true courſe and diſtance.

Example. Suppoſe a ſhip from the latitude of 44° 38' north, ſails between ſouth and eaſt upon ſeveral courſes, near the middle of the quadrant, for the ſpace of 24 hours, and is then found by dead reckoning to be in the latitude of 42° 15' north, and to have made of eaſting 136 miles; but by obſervation ſhe is found to be in the latitude of 42° 04' north: Required her true courſe and diſtance.

With the true diſtance of latitude 154 miles, and the direct diſtance by dead reckoning 197.4, you will find (by *Caſe* 3. *of Plain Sailing*) the new departure to be 123.4, and half the ſum of this and the departure by dead reckoning will be 123.7 the true departure; then with this, and the true difference of latitude, you will find (by *Caſe* 4. *of Plain Sailing*) the true courſe to be S 39° 00' E, and the direct diſtance 198.2 miles.

7. In keeping a ſhip's reckoning at ſea, the common method is to take from the log-board the ſeveral courſes and diſtances ſtemmed by the ſhip laſt 24 hours, and to transfer theſe together with the moſt remarkable occurrences into the log-book, into which alſo are inſerted the courſes corrected, and the difference of latitude and difference of longitude made good upon each; then the whole day's work being finiſhed in the log-book, if the latitude by account agree with the latitude by obſervation, the ſhip's place will be truly determined; if not, then the reckoning muſt be corrected according to the preceding rules, and placed in the journal.

The form of the Log-book and Journal, together with an example of 2 days work, you have here ſubjoined.

Note, To expreſs the days of the week, they commonly uſe the characters by which the ſun and planets are expreſſed, *viz.* ☉ denotes *Sunday*, ☾ *Monday*, ♂ *Tueſday*, ☿ *Wedneſday*, ♃ *Thurſday*, ♀ *Friday*, and ♄ denotes *Saturday*.

The

The FORM of the

LOG-BOOK,

With the Manner of working Days Works at Sea.

The Log-Book.					
H.	K.	½K.	Courfes.	Winds.	Obfervations and Accidents. ☽— Day of——
					Fair weather, at
1					four this afternoon
2				North	I took my depar-
3					ture from the Li
					zard, in the lati-
4					tude of 5° 00'
5	7		SW*b*S	N*b*E	north, it bearing
6	7				NNE, diftance
					five leagues.
7	7	1			
8	7	1			
9	6				
10	6				
11	6		SSW	E*b*S	The gale increa-
12	6	1			fing and being un-
					der all our fails.
1	6	1			After three this
2	6	1	SW*b*W	NNE	morning, frequent
3	6	1			fhowers with thick
					weather till near
4	7				noon.
5	7	1			
6	8				
7	8				
8	8		SW	ENE	The variation I
9	8	1			reckon to be one
					point wefterly.
10	9				
11	8	1	SW½W	NE*b*E	
12	8				

The Log-Book.					
Courfes Correct	Dift.	Diff. Lat.		Diff. long.	
		N	S	E	W
SSW	50		46.2		29.4
S*b*W	19		18.6		5.5
SW	49		29.7		45.5
SW*b*S	24.5		20.2		20.0
SW½S	25.5		19.5		24.6
			144.2		125.0

Hence the fhip, by account, has come to the latitude of 47° 46' north, and has differed her longitude 2° 5' wefterly; fo this day I have made my way good S 31° 31' W, diftance 157.4 miles.

At noon the Lizard bore from me N 31° 31' E, diftance 157.4 miles; and having obferved the latitude, I found it agreed with the latitude by account.

The

The Log Book.					
H	K.	½K.	Courses.	Winds.	Observations and Accidents. ♂— Day of——
1	2		SSW	W	This 24 hours,
2	1	1	Handed the main		strong gale of wind
3	1	1	and fore courses,		and variable.
4	1	1	lee-way 6 points		
5	1	1			
6	1				
7	1				
8	1	1	The wind increa-		
9	1		sing, we tried a		
10	1		hull, lee-way 7		The variation I
11	1		points.		judge to be 1
12	1	1			point west.
1	2		SW*b*W	NW*b*W	
2	1	1	Set main-sail, lee-		
3	1		way 4 ½ points.		
4	1				
5	1				
6	1	1			
7	1				
8	4		S*b*E	SW*b*W	
9	4	1	Set fore-sail, lee-		
10	4	1	way 3 points.		
11	5				Lat. by observa-
12	4	1			tion, 47° 06' N.

The Log-Book.					
Courses Correct.	Dist.	Diff. Lat.		Diff. Long.	
		N	S	E	W
S E *b* E	32.5		17.8	37.7	
E S E	6		2.3	10 6	
S ½ E	9		8.9	1.3	
			29.0	49.6	

Hence the ship, by account, has come to the latitude of 47° 17′ north, and has differed her longitude 49′ easterly; consequently she has got 1° 16′ to the westward of the Lizard, and has made her way good the last 24 hours S49° 08' E, distance 44.3 miles.

At noon the Lizard bore from me north 17° 7' east, distance 170.6 miles.

This day I had an observation, and found the latitude by account to disagree with the latitude by observation by 11 minutes, I being so much further to the southward than by dead reckoning, which by the third of the preceding rules I correct as in the Journal.

A Journal from the Lizard towards Jamaica in the ship Neptune, *J. M.* commander.

Week Days	Months Years	Month Days	Winds	Direct Course	Dist. Miles	Latitude Correct	Whole Diff. Long. made	Bearing and Dist. from the Lizard.	Remarkable Observations and Accidents.
☽	——	——	N *b* E E *b* S N N E E N E N E *b* E	S 31, 31 W	157.4	47°, 46′	2°, 5′ W	At noon the Lizard bore N. 31° 31′ E. Dist. 157.4 miles.	Fair weather at four *P. M.*, I took my departure from the Lizard, it bearing N N E distance 5 leagues.
♂	——	——	West N W *b* W S W *b* W	S 34, 01 E	48.2	47°, 06′	1°, 35′ W	At noon the Lizard bore S. 17° 55′ W. Dist. 183 miles.	Strong gales of wind and variable.

NAUMACHIA,

NAUMACHIA, in antiquity, a ſhew or ſpectacle among the ancient Romans, repreſenting a ſea-fight.

NAUMBURG, a city of Germany, the capital of the county of Sax Naumburg, in Upper Saxony, ſituated in E. long. 12°, N. lat. 51° 15′.

NAUSEA, in medicine, a reaching, or propenſity and endeavour to vomit, ariſing from a loathing of food, excited by ſome viſcous humour that irritates the ſtomach.

NAUTICAL PLANISPHERE, a deſcription of the terreſtrial globe upon a plane for the uſe of mariners, more uſually called chart.

NAUTILUS, in zoology, a genus belonging to the order of vermes teſtacea. The ſhell conſiſts of one ſpiral valve, divided into ſeveral apartments by partitions. There are 17 ſpecies, principally diſtinguiſhed by peculiarities in their ſhells.

NAVY, the fleet or ſhipping of a prince or ſtate.

The management of the Britiſh navy-royal, under the lord high admiral of Great Britain, is entruſted to principal officers and commiſſioners of the navy, who hold their places by patent. The principal officers of the navy are four, *viz.* the treaſurer, whoſe buſineſs it is to receive money out of the exchequer, and to pay all the charges of the navy, by warrant from the principal officers: comptroller, who attends and comptrols all payment of wages, is to know the rates of ſtores, to examine and audite all accounts, *&c.*: ſurveyor, who is to know the ſtates of all ſtores, and ſee wants ſupplied; to eſtimate repairs, charge boatſwains, *&c.* with what ſtores they receive, and at the end of each voyage to ſtate and audite accounts: clerk of the acts, whoſe buſineſs it is to record all orders, contracts, bills, warrants, *&c.*

The commiſſioners of the navy are five: the firſt executes that part of the comptroller's duty which relates to the comptrolling the victuallers accounts; the ſecond, another part of the ſaid comptroller's duty, relating to the account of the ſtore-keepers of the yard; the third has the direction of the navy at the port of Portſmouth; the fourth has the ſame at Chatham; and the fifth, at Plymouth.

There are alſo other commiſſioners at large, the number more or leſs according to the exigencies of public affairs; and ſince the increaſe of the royal navy, theſe have ſeveral clerks under them, with ſalaries allowed by the king.

The victualling of the royal navy hath formerly been undertaken by contract; but is now managed by commiſſioners, who hold their office on Tower-hill, London.

The navy-office is where the whole buſineſs concerning the navy is managed by the principal officers and commiſſioners.

The royal navy of Great Britain is now in a very flouriſhing ſtate; having been diligently kept up in late reigns, as the natural ſtrength of the kingdom. When it is complete, it is divided into three ſquadrons, diſtinguiſhed by the different colours of the flags carried by the reſpective admirals belonging to the ſame.

NAXIA, or NIXIA, one of the iſlands of the Archipelago, about an hundred miles in circumference, ſituated in E. long. 26°, and N. lat. 36° 30′.

NAZARENES, in church hiſtory, a name originally given to all Chriſtians in general, on account that Jeſus Chriſt was of the city of Nazareth; but afterwards reſtrained to a ſect of heretics, whoſe religion conſiſted of a ſtrange jumble of Judaiſm and Chriſtianity; obſerving at the ſame time the Moſaical law and the ſeveral rites of the Chriſtian religion.

NAZARITES, among the Jews, perſons who either of themſelves, or by their parents, were dedicated to the obſervation of nazariteſhip. They were of two ſorts: namely, ſuch as were bound to this obſervance for only a ſhort time, as a week or month; or thoſe who were bound to it all their lives. All that we find peculiar in the latter's way of life, is, that they were to abſtain from wine and all intoxicating liquors, and never to ſhave or cut off the hairs of their heads. The firſt ſort of Nazarites were moreover to avoid all defilement; and if they chanced to contract any pollution before the term was expired, they were obliged to begin afreſh. Women as well as men might bind themſelves to this vow.

NEALED, among ſeamen, is uſed when the ſounding is deep water cloſe to the ſhore; as alſo when the ſhore is ſandy, clayey, ouzy, or foul and rocky ground.

NEAPED. When a ſhip wants water ſo that ſhe cannot get out of the harbour, off the ground, or out of the dock, the ſeamen ſay ſhe is neaped, or beneaped.

NEATH, a town of Glamorganſhire, in ſouth Wales, ſituated on the river Neath, near the Briſtol channel, twenty-eight miles north weſt of Landaff.

NEBULY, or NEBULEE, in heraldry, is when a coat is charged with ſeveral little figures, in form of words, running within one another, or when the outline of a bordure, ordinary, *&c.* is indented or waved, as repreſented in Plate CXXXIV. fig. 3.

NECESSARY, in a philoſophical ſenſe, that which cannot but be, or cannot be otherwiſe.

NECESSITY, whatever is done by a neceſſary cauſe, or a power that is irreſiſtible, in which ſenſe it ſtands oppoſed to freedom. See METAPHYSICS.

NECK, in anatomy, is that ſlender part ſituated between the head and trunk of the body. See ANATOMY.

NECKAR, a river of Germany, which riſes in the ſouth part of the circle of Swabia, and falls into the Rhine at Manheim.

NECROMANCY, a ſpecies of divination, performed by raiſing the dead, and extorting anſwers from them. See DIVINATION.

NECTAR, among ancient poets, the drink of the fabulous deities of the heathens, in contradiſtinction from their ſolid food, which was called ambroſia.

NECTARINE. See PERSICA.

NECTARIUM, among botaniſts. See BOTANY, p. 637.

NECYDALIS, in zoology, a genus of inſects belonging to the order of coleoptera. The feelers are ſetaceous; the elytra are ſhorter and narrower than the wings; and the

the tail is ſimple. There are eleven ſpecies, chiefly diſtinguiſhed by the ſize and figure of the elytra.

NEEDHAM, a market-town of Suffolk, ſituated on the river Orwel, eight miles north-weſt of Iſpwich.

NEEDLE, a very common little inſtrument or utenſil, made of ſteel, pointed at one end, and pierced at the other, uſed in ſewing embroidery, tapeſtry, *&c.*

Needles make a very conſiderable article in commerce, though there is ſcarce any commodity cheaper, the conſumption of them being almoſt incredible. The ſizes are from n° 1. the largeſt, to n° 25 the ſmalleſt. In the manufacture of needles, German and Hungarian ſteel are of moſt repute.

In the making of them, the firſt thing is to paſs the ſteel through a coal fire, and under a hammer, to bring it out of its ſquare figure into a cylindrical one. This done, it is drawn through a large hole of a wire-drawing iron, and returned into the fire, and drawn through a ſecond hole of the iron, ſmaller than the firſt, and thus ſucceſſively from hole to hole, till it has acquired the degree of fineneſs required for that ſpecies of needles, obſerving every time it is to be drawn, that it be greaſed over with lard, to render it more manageable. The ſteel thus reduced to a fine wire, is cut in pieces of the length of the needles intended. Theſe pieces are flatted at one end on the anvil, in order to form the head and eye; they are then put into the fire, to ſoften them farther; and thence taken out and pierced at each extreme of the flat part on the anvil, by force of a puncheon of well tempered ſteel, and laid on a leaden block to bring out, with another puncheon, the little piece of ſteel remaining in the eye. The corners are then filed off the ſquare of the heads, and a little cavity filed on each ſide of the flat of the head; this done, the point is formed with a file, and the whole filed over; they are then laid to heat red hot on a long flat narrow iron, crooked at one end, in a charcoal fire, and when taken out thence are thrown into a baſon of cold water to harden. On this operation a good deal depends; too much heat burns them, and too little leaves them ſoft; the medium is learned by experience. When they are thus hardened, they are laid in an iron ſhovel on a fire more or leſs briſk in proportion to the thickneſs of the needles; taking care to move them from time to time. This ſerves to temper them, and take off their brittleneſs; great care here too muſt be taken of the degree of heat. They are then ſtraightened one after another with the hammer, the coldneſs of the water uſed in hardenin them having twiſted the greateſt part of them.

The next proceſs is the poliſhing them. To do this, they take twelve or fifteen thouſand needles, and range them in little heaps againſt each other on a piece of new buckram ſprinkled with emery-duſt. The needles thus diſpoſed, emery duſt is thrown over them, which is again ſprinkled with oil of olives; at laſt the whole is made up into a roll, well bound at both ends. This roll is then laid on a poliſhing table, and over it a thick plank loaden with ſtones, which two men work backwards and forwards a day and a half or two days, ſucceſſively, by which means the roll thus continually agitated by the weight and motion of the plank over it, the needles withinſide being rubbed againſt each other with oil and emery are inſenſibly poliſhed. After poliſhing, they are taken out, and the filth waſhed off them with hot water and ſoap: they are then wiped in hot bran, a little moiſtened, placed with the needles in a round box, ſuſpended in the air by a cord, which is kept ſtirring till the bran and needles be dry. The needles thus wiped in two or three different brans, are taken out and put in wooden veſſels, to have the good ſeparated from thoſe whoſe points or eyes have been broke either in poliſhing or wiping; the points are then all turned the ſame way, and ſmoothed with an emery-ſtone turned with a wheel. This operation finiſhes them, and there remains nothing but to make them into packets of two hundred and fifty each.

Magnetical NEEDLE, in navigation, a needle touched with a loadſtone, aad ſuſtained on a pivot or centre; on which playing at liberty, it directs itſelf to certain points in or under the horizon. See NAVIGATION.

NEEDLE FISH. See SYNGNATHUS.

NEEDLES, two capes, or head-lands, at the weſt end of the iſle of Wight, which is very difficult to paſs on account of the ſands and rocks.

NEFASTI DIES, in Roman antiquity, an appellation given to ſuch days wherein it was not allowed to adminiſter juſtice, uſually marked in the kalendar by N. or N. P. *i. e.* nefaſtus prima, when only nefaſtus for the firſt part of it.

NEGAPATAN, a port-town of the hither India, ſituated on the coaſt of Coromandel: E. long. 79°, N. lat. 11° 15'.

NEGATION, in logic, an act of the mind affirming one thing to be different from another; as, that the ſoul is not matter.

NEGATIVE, in general, ſomething that implies a negation: thus we ſay, negative quantities, negative ſigns, negative powers, *&c.* See METAPHYSICS and LOGIC.

NEGOMBO, a port-town on the weſt coaſt of the iſle of Ceylon, in the Indian ocean, ſubject to the Dutch: E. long. 78°, N. lat. 7° 25'.

NEGRAIS, a port-town of Pegu, in the further India, ſituated on the weſt ſide of the bay of Bengal: E. lon. 92° 30', N. lat. 17°.

NEGRIL POINT, the moſt weſterly promontory of the iſland of Jamaica.

NEGROES, properly the inhabitants of Nigritia in Africa, alſo called blacks and moors; but this name is now given to all the blacks.

The origin of the negroes, and the cauſe of this remarkable difference from the reſt of the human ſpecies, has much perplexed the naturaliſts. Mr. Boyle has obſerved, that it cannot be produced by the heat of the climate: for though the heat of the ſun may darken the colour of the ſkin, yet experience does not ſhew that it is ſufficient to produce a new blackneſs, like that of the negroes.

In Africa itſelf, many nations of Æthiopia are not black, nor were there any blacks originally in the Weſt Indies. In many parts of Aſia, under the ſame parallel with the African region, inhabited by blacks, the

the people are but tawny. He adds, that there are negroes in Africa, beyond the southern tropic; and that a river sometimes parts nations, one of which is black and the other only tawny. Dr Barriere alledges that the gall of negroes is black, and being mixed with their blood is deposited between their skin and scarf-skin. However, Dr Mitchel of Virginia, in the philosophical transactions, nº 476, has endeavoured by many learned arguments to prove, that the influence of the sun in hot countries, and the manner of life of their inhabitants, are the remote causes of the colour of negroes, indians, *&c.* and indeed it would be a strong confirmation of his doctrine, if we would see any people, originally white, become black and woolly by transplantation, or *vice versa.*

Negroes are brought from Guinea, and other coasts of Africa, and sent into the colonies in America, to cultivate tobacco, sugar, indigo, *&c.* and in Mexico and Peru, to dig in the mines; and this commerce, which is scarce defensible on the foot either of religion or humanity, is now carried on by all the nations that have settlements in the West Indies. Those negroes make the best slaves who are brought from Angola, Senegal, Cape Verd, the river Gambia, the kingdoms of Joloffes, Daniel, Galland, *&c.*

There are various ways of procuring them: some, to avoid famine, sell themselves, their wives and children, to their princes, or other great men; others are made prisoners of war; and great numbers are seized in excursions made for that very purpose by the petty princes upon one another's territories, in which it is usual to sweep away all without distinction of age or sex.

NEGROES-ISLAND, one of the Philippine islands, in the Indian ocean, subject to Spain; so called, because most of the inhabitants are blacks: E. long. 120°, N. lat. 10°.

NEGROLAND, or NIGRITIA, a country of Africa, which lies between 18° west and 15° east longitude, and between 10° and 20° of north latitude, the great river Niger running through it. It is bounded by Zaara, or the desart, on the north, by unknown countries on the east, by Guinea on the south, and by the Atlantic ocean on the west.

NEGROPONT, or EGRIPOS, the capital of the island of Negropont, anciently called Euboea, situated in the Archipelago, on the west side of the island; where the strait is so narrow, that it is joined to the continent by a bridge: E. lon. 24° 30', N. lat. 38° 30'.

NEHEMIAH, a canonical book of the Old Testament so called from the name of its author. Nehemiah was born in Babylon, during the captivity, and succeeded Ezra in the government of Judah and Jerusalem. He was a Jew, and was promoted to the office of cup-bearer to Artaxerxes Longimanus king of Persia; when the opportunities he had of being daily in the king's presence, together with the favour of Esther the queen, procured him the favour of being authorized to repair and fortify the city of Jerusalem, in the same manner as it was before its destruction by the Babylonians. On his going to Jerusalem, he finished the rebuilding of the walls in fifty-two days, and dedicated the gates of the city with great solemnity. He then reformed some abuses which had crept in among his countrymen, particularly the extortion of the usurers, by which the poor were so oppressed as to be forced to sell their lands and children for support: after which he returned to Persia, and came back again with a new commission, by virtue of which he regulated every thing relating both to the state and religion of the Jews. The history of these transactions is the subject of this book.

NELLENBURG, a city of Swabia, in Germany, capital of a county of the same name, situated fifteen miles north of Constance.

NEMÆA, a town in the Morea, thirty miles south of Corinth, where the ancient Nemæan games were celebrated.

NEMÆAN GAMES, were so called from Nemæa, a village between the cities of Cleonæ and Philus, where they were celebrated every third year. The exercises were chariot races, and all the parts of the pentathlum. These games were instituted in memory of Opheltes, or Archemorus, the son of Euphetes and Creusa, and nursed by Hypsipyle; who leaving him in a meadow, while she went to shew the besiegers of Thebes a fountain, at her return found him dead, and a serpent twined about his neck; whence the fountain, before called Langia, was named Archemorus; and the captains, to comfort Hypsipyle, instituted these games. Others ascribe their institution to Hercules, after his victory over the Nemæan lion.

NEMOURS, a city in the isle of France, forty-two miles south of Paris: E. long 2° 45', N. lat. 48° 17'.

NEOMENIA, or NOUMENIA, a festival of the ancient Greeks, at the beginning of every lunar month, which was, as the name imports, observed upon the day of the new moon, in honour of all the gods, but especially Apollo, who was called Neomenios; because the sun is the fountain of light, and whatever distinction of times and seasons may be taken from other planets, yet they are all owing to him as the original of those borrowed rays by which they shine.

NEOPHYTES, *new plants*, a name given by the ancient Christians to those heathens who had newly embraced the faith; such persons being considered as regenerated, or born anew by baptism. The term neophytes has been also used for new priests, or those just admitted into orders, and sometimes for the novices in monasteries. It is still applied to the converts made by the missionaries among the infidels.

NEOTTIA, in botany. See OPHRYS.

NEPA, in zoology, a genus of insects belonging to the order of hemiptera. The rostrum is inflected; the antennæ are shorter than the thorax; and the hind-feet are hairy, and fitted for swimming. There are seven species.

NEPENTHES, in botany, a plant of the gynandria tetrandria class. The calix consists of four segments; it has no corolla; and the capsule has four cells. There is but one species, a native of Ceylon.

NEPER's RODS, or BONES, an instrument invented by

Fig. 1. NEPERS RODS

No. 1.

1	1	2	3	4	5	6	7	8	9	0
2	/2	/4	/6	/8	1/0	1/2	1/4	1/6	1/8	/0
3	/3	/6	/9	1/2	1/5	1/8	2/1	2/4	2/7	/0
4	/4	/8	1/2	1/6	2/0	2/4	2/8	3/2	3/6	/0
5	/5	1/0	1/5	2/0	2/5	3/0	3/5	4/0	4/5	/0
6	/6	1/2	1/8	2/4	3/0	3/6	4/2	4/8	5/4	/0
7	/7	1/4	2/1	2/8	3/5	4/2	4/9	5/6	6/3	/0
8	/8	1/6	2/4	3/2	4/0	4/8	5/6	6/4	7/2	/0
9	/9	1/8	2/7	3/6	4/5	5/4	6/3	7/2	8/1	/0

No. 2.

1	4	7	6	8
2	/8	1/4	1/2	1/6
3	1/2	2/1	1/8	2/4
4	1/6	2/8	2/4	3/2
5	2/0	3/5	3/0	4/0
6	2/4	4/2	3/6	4/8
7	2/8	4/9	4/2	5/6
8	3/2	5/6	4/8	6/4
9	3/6	6/3	5/4	7/2

Fig. 2. NOCTURNAL

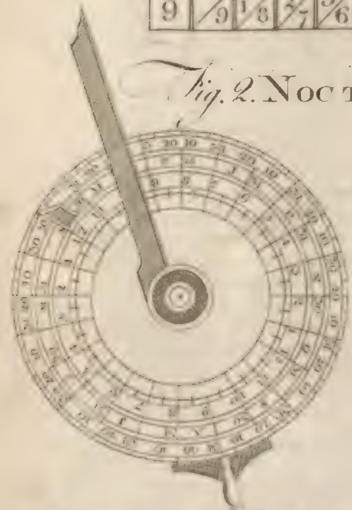


Fig. 3. NEBULY

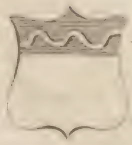
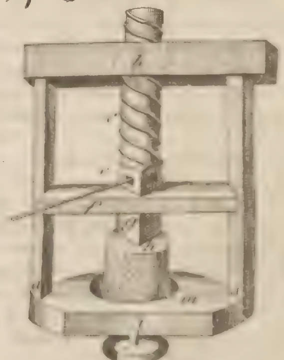
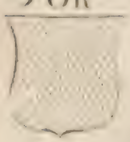


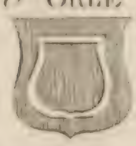
Fig. 4. OLIVE PRESS



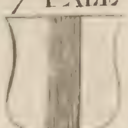
5 OR



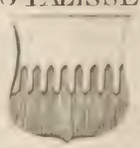
6 ORLE



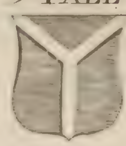
7 PALE



8 PALISSE



9 PALL



10 PALY

11 PARTY PER PALE.

12 PASSION CROSS

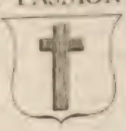
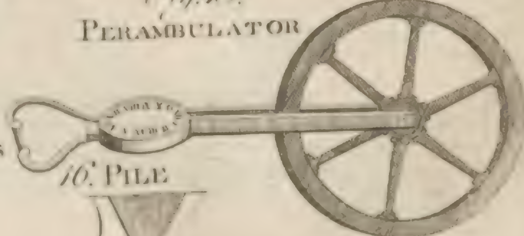
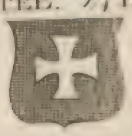


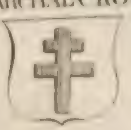
Fig. 15. PERAMBULATOR



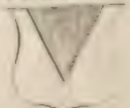
13 PATEE.



14 PATRIARCHAL CROSS



16. PILE



C. 1. B. sc.

by J. Neper, baron of Merchiston, in Scotland, whereby the multiplication and division of large numbers are much facilitated.

As to the construction of NEPER'S RODS: suppose the common table of multiplication to be made upon a plate of metal, ivory, or paste-board, and then conceive the several columns (standing downwards from the digits on the head) to be cut asunder; and these are what we call Neper's rods for multiplication. But then there must be a good number of each; for as many times as any figure is in the multiplicand, so many rods of that species (*i. e.* with that figure on the top of it) must we have; though six rods of each species will be sufficient for any example in common affairs: there must also be as many rods of o's.

But before we explain the way of using these rods, there is another thing to be known, *viz.* that the figures on every rod are written in an order different from that in the table. Thus, the little square space or division in which the several products of every column are written, is divided into two parts by a line across from the upper angle on the right to the lower on the left; and if the product is a digit, it is set in the lower division; if it has two places, the first is set in the lower, and the second in the upper division; but the spaces on the top are not divided; also there is a rod of digits, not divided, which is called the index rod, and of this we need but one single rod. See the figure of all the different rods, and the index, separate from one another, in Plate CXXXIV. fig 1.

Multiplication by NEPER'S RODS. First lay down the index rod; then on the right of it set a rod whose top is the figure in the highest place of the multiplicand; next to this again, set the rod whose top is the next figure of the multiplicand; and so on in order, to the first figure. Then is your multiplicand tabulated for all the nine digits; for in the same line of squares standing against every figure of the index rod, you have the product of that figure, and therefore you have no more to do but to transfer the products and sum them. But in taking out these products from the rods, the order in which the figures stand obliges you to a very easy and small addition; thus, begin to take out the figure in the lower part, or unit's place, of the square of the first rod on the right; add the figure in the upper part of this rod to that in the lower part of the next, and so on, which may be done as fast as you can look on them. To make this practice as clear as possible, take the following example.

Example: To multiply 4768 by 185. Having set the rods together for the number 4768 (*ibid* n° 2.) against 5 in the index, I find this number, by adding according to the rule, - - - 23840

Against 8, this number - - -	38144
Against 3, this number - - - -	14304
Total product	1835680

To make the use of the rods yet more regular and easy, they are kept in a flat square box, whose breadth is that of ten rods, and the length that of one rod, as thick as to hold six (or as many as you please) the capacity of the box being divided into ten cells for the different species of rods. When the rods are put up in the box (each species in its own cell distinguished by the first figure of the rod set before it on the face of the box near the top) as much of every rod stands without the box as shews the first figure of that rod; also upon one of the flat sides without and near the edge, upon the left hand, the index rod is fixed; and along the foot there is a small ledge, so that the rods when applied are laid upon this side, and supported by the ledge, which makes the practice very easy; but in case the multiplicand should have more than nine places, that upper face of the box may be made broader. Some make the rods with four different faces, and figures on each for different purposes.

Division by NEPER'S RODS. First tabulate your divisor; then you have it multiplied by all the digits, out of which you may chuse such convenient divisors as will be next less to the figures in the dividend, and write the index answering in the quotient, and so continually till the work is done. Thus 2179788, divided by 6123, gives in the quotient 356.

Having tabulated the divisor 6123, you see that 6123 cannot be had in 2179; therefore take five places, and on the rods find a number that is equal or next less to 21797, which is 18369; that is, 3 times the divisor; wherefore set 3 in the quotient, and substract 18369 from the figures above, and there will remain 3428; to which add 8, the next figure of the dividend, and seek again on the rods for it, or the next less, which you will find to be five times; therefore set 5 in the quotient, and subtract 30615 from 34288, and there will remain 3673; to which add 8, the last figure in the dividend, and finding it to be just 6 times the divisor, set six in the quotient.

```
6123)2179788(356
     18369··
     -------
      34288
      30615
      -------
       36738
       36738
       -------
       00000
```

NEPETA, in botany, a genus of the didynamia gymnospermia class. The intermediate lacinium of the inferior lip is crenated; the margin of the faux is reflected; and the stamina are near each other. There are 14 species, only one of which, *viz.* the cataria, nap, or cat-mint, is a native of Britain.

NEPHEW, a term relative to uncle and aunt, signifying a brother or sister's son; who, according to the civil law, is in the third degree of consanguity; but according to the canon, in the second.

NEPHRITIC, something that relates to the kidneys.

NEPHRITIC WOOD, a wood of a very dense and compact texture, and of a fine grain, brought us from New Spain, in small blocks, in its natural state, and covered with its bark.

This wood is a very good diuretic, and is said to be of

of great uſe with the Indians in all diſeaſes of the kidneys and bladder, and in ſuppreſſions of urine, from whatever cauſe. It is alſo recommended in fevers and obſtructions of the viſcera. The way of taking it, among the Indians, is only an infuſion in cold water.

NEPHRITICS, in pharmacy, medicines proper for diſeaſes of the kidneys, eſpecially the ſtone.

Such particularly are the roots of althæa, dog's graſs, aſparagus, ſago, pellitory of the wall, mallows, pimpinella, red chick peaſe, peach kernels, turpentine, the nephritic ſtone, the nephritic wood, *&c.* and diuretics.

NEPHRITIS, in medicine, an inflammation of the kidneys. See MEDICINE.

NEREIDS, in the pagan theology, ſea-nymphs, daughters of Nereus and Doris.

The nereids were eſteemed very handſome, inſomuch that Caſſiope, the wife of Cepheus king of Ethiopia, having triumphed over all the beauties of the age, and daring to vie with the nereids, they were ſo enraged that they ſent a prodigious ſea-monſter into the country; and to appeaſe them, ſhe was commanded by the oracle to expoſe her daughter Andromeda, bound to a rock, to be devoured by the monſter.

In ancient monuments the nereids are repreſented riding upon ſea-horſes, ſometimes with an entire human form, and at other times with the tail of a fiſh.

NEREIS, in zoology, a genus beloging to the order of vermes molluſca. The body is oblong, linear, and fitted for creeping; it is furniſhed with lateral pincilled tentacula. There are eleven ſpecies.

NERICIA, a province of Sweden, bounded by Weſtmania on the north, by Sunderland on the eaſt, and by Gothland on the ſouth and weſt.

NERIUM, in botany, a genus of the pentandria monogynia claſs. The ſeeds are furniſhed with plumes; and the tube of the corolla terminates in a lacerated corona. There are four ſpecies, none of them natives of Britain.

NERVES, in anatomy. See ANATOMY, p. 247.

NEST. See NIDUS.

NESTORIANS, a Chriſtian ſect, the followers of Neſtorius, biſhop and patriarch of Conſtantinople; who, about the year 529, taught that there were two perſons in Jeſus Chriſt, the divine and the human, which are united, not hypoſtatically or ſubſtantially, but in a myſtical manner; whence he concluded, that Mary was the mother of Chriſt and not the mother of God. For this opinion, Neſtorius was condemned and depoſed by the council of Epheſus; and the decree of this council was confirmed by the emperor Theodoſius, who baniſhed the biſhop to a monaſtery.

NETHERLANDS, anciently called Belgia, but ſince denominated Low-Countries or Netherlands from their low ſituation, are ſituated between 2° and 7° of eaſt longitude, and between 50° and 53° 30′ of north latitude; and are bounded by the German ſea on the north, Germany on the eaſt, by Lorrain and France on the ſouth, and by another part of France and the Britiſh ſeas on the weſt; extending near three hundred miles in length from north to ſouth, and two hundred miles in breadth from eaſt to weſt. They conſiſt of ſeventeen provinces; ten of which are called the Auſtrian and French Netherlands, and the other ſeven the United Provinces.

NETTINGS, in a ſhip, a ſort of grates made of ſmall ropes ſeized together with rope-yarn or twine, and fixed on the quarters and in the tops; they are ſometimes ſtretched upon the ledges from the waſte trees to the roof trees, from the top of the forecaſtle to the poop; and ſometimes are laid in the waſte of a ſhip, to ſerve inſtead of gratings.

NETTLE, in botany. See URTICA.

Dead NETTLE. See LAMIUM.

NETTLE-TREE. See CELTIS.

NETTUNO, a port town of Italy, in the Campagna di Roma; ſituated on the Mediterranean, thirty miles ſouth-eaſt of Rome.

NEVERS, a city of France, capital of the Nivernois: E. long. 3° 15′, N. lat. 46° 50′.

NEUFCHATEL, the capital of the counties of Neufchatel and Vallengin, in Switzerland, which together form one free and independant ſtate, ſubject to the king of Pruſſia: E. long. 6° 35′, N. lat. 47° 10′.

NEUFCHATEL is alſo a town of Normandy in France, twenty-three miles north-eaſt of Rouen.

NEVIN, or NEWIN, a market town of North-Wales eighteen miles ſouth weſt of Caernarvon.

NEVIS, one of the Caribbee-iſlands, divided from the eaſt end of St. Chriſtophers by a narrow channel.

NEURADA, in botany, a genus of the decandria decagynia claſs. The calix conſiſts of five ſegments, and the corolla of five leaves; the capſule has ten cells, and ten ſharp-pointed ſeeds. There is but one ſpecies, a native of Egypt.

NEURITICS, in pharmacy, medicines good in diſorders of the nerves.

NEUROGRAPHY, ſignifies a deſcription of the nerves.

NEUROPTERA. See NATURAL HISTORY, p. 364, col. 1.

NEUSTAT, a city of Germany, thirty miles ſouth of Vienna.

NEUSTAT is alſo a town of Lower Saxony, ſixteen miles north-weſt of the city of Hanover.

NEUTER, or NEUTER GENDER, in grammar, one of the three genders of nouns, ſo called as being neither maſculine nor feminine. See GRAMMAR.

NEUTRAL SALTS, among chemiſts, a ſort of ſalts neither acid nor alkaline, but partaking of the nature of both. See CHEMISTRY.

NEUTRALITY, the ſtate of a perſon or thing that is neuter, or that takes part with neither ſide.

NEWARK, a borough town of Nottinghamſhire, fifteen miles north-eaſt of Nottingham. In ſends two members to parliament.

NEWBOROUGH, a market town of Angleſey, fifteen miles north-weſt of Beaumaris.

NEWBURG, a city of Bavaria, in Germany, twenty eight miles north-eaſt of Augſburg.

NEWBURG is alſo the name of two other towns of Germany;

many; one in Swabia, twenty five miles weſt of Stutgart; and the other likewiſe in Swabia, twelve miles north of Baſil.

NEWBURY, a market town of Berkſhire, fifteen miles weſt of Reading.

NEWCASTLE, the county-town of Northumberland, ſituated upon the river Tine: W. long. 1° 10′, N. lat. 55°. It ſends two members to parliament.

NEWCASTLE, a borough-town of Staffordſhire, ten miles north of Stafford. It ſends two members to parliament.

NEWCASTLE, a market town of Caermarthenſhire, in South Wales, fifteen miles north of Caermarthen.

NEWEL, in architecture, is the upright poſt which a pair of winding ſtairs turn about; this is properly a cylinder of ſtone which bears on the ground, and is formed by the end of the ſteps of the winding ſtairs.

NEWFIDLERS SEA, a lake thirty five miles long, on the north-weſt part of Upper Hungary.

NEW FOREST, a part of Hampſhire, oppoſite to the Iſle of Wight, appropriated by act of parliament for the growth of oaks to build the royal navy. See FOREST.

NEWFOUNDLAND, a triangular iſland, three hundred and fifty miles in length from north to ſouth, and two hundred miles in breadth at the baſe from eaſt to weſt; ſituated in North America, between 55° and 61° of weſt longitude, and between 47° and 52° of north latitude; bounded by the narrow ſtraights of Belliſle on the north, by the Atlantic ocean on the eaſt and ſouth, and by the bay of St. Lawrence on the weſt. It is ſubject to England; but the fiſhing banks on this coaſt are frequented by moſt European nations.

NEWHAUSEL, a city of Upper Hungary, ſituated on the river Neytra: E. long. 18° 12′, N. lat. 48° 25′.

NEWMARK, a city of Tranſilvania, ſubject to the houſe of Auſtria: E. long. 23° 25′, N. lat. 47° 35′.

NEWMARK is alſo a town of Germany in the palatinate of Bavaria, thirty miles north-weſt of Ratiſbon.

NEWMARKET, a market town, ſituated both in Cambridgeſhire and Suffolk, twelve miles eaſt of Cambridge.

NEWNHAM, a market town, ten miles ſouth-weſt of Gloceſter.

NEWPORT, a port town of Flanders, nine miles ſouth-weſt of Oſtend.

NEWPORT is alſo a borough town of the Iſle of Wight, which ſends two members to parliament.

NEWPORT is alſo a borough of Cornwal, ten miles weſt of Launceſton, which ſends two members to parliament.

NEWPORT is alſo the name of ſeveral market towns; one fifteen miles eaſt of Shrewſbury, another eighteen miles ſouth-weſt of Monmouth, and a third ſixteen miles north-eaſt of St Davids.

NEWPORT-PAGNEL, a market-town, ſixteen miles north of Ailſbury.

NEWSTAT, the name of ſeveral towns; one eight miles north of Landau; another fifteen miles ſouth-weſt of Ratiſbon; a third in Sileſia, fifteen miles ſouth of Breſlaw; a fourth in Hungary, ſixty-five miles eaſt of Tockay; and a fifth in Moravia, ten miles north of Olmutz.

NEWT, or EFT, in zoology. See LACERTA.

NEWTON, a borough town, thirty five miles ſouth of Lancaſter.

It ſends two members to parliament.

NEWTON is alſo a borough town in the Iſle of Wight, twelve miles ſouth of Southampton: it ſends two members to parliament.

NEWTONIAN PHILOSOPHY, the doctrine of the univerſe, and particularly of the heavenly bodies, their laws, affections, &c. as delivered by Sir Iſaac Newton. See ASTRONOMY, MECHANICS, OPTICS, &c.

NEYLAND, a market-town of Suffolk, fourteen miles ſouth-weſt of Ipſwich.

NIAGARA, a prodigious cataract in Canada, in North America, between the lakes Erie and Ontario, where the water falls from high rocks 156 feet perpendicular. The miſt which this fall occaſions may be ſeen at fifteen miles diſtance riſing as high as the clouds, and forming a beautiful rainbow.

NIBANO, a town of Italy, in the dutchy of Parma, thirty five miles weſt of Parma.

NICARAGUA, a province of Mexico, bounded by the province of Honduras on the north, by the North-ſea on the eaſt; by the province of Coſtarica on the ſouth-eaſt, and by the South ſea on the ſouth-weſt; being 400 miles long, and 120 broad. Nicaragua lake runs through the middle of the province.

NICARIA, one of the iſlands of the Archipelago, in Aſiatic Turky: E. long. 26° 5′, N. lat. 37°.

NICASTRO, a town of Naples, in the territory of Calabria; E. long. 16° 40′, N. lat. 39° 15′.

NICE, the capital of the county of the ſame name, ſituated on the mediterranean, at the mouth of the river Var: E. long. 7° 15′, N. lat. 43° 40′.

NICE is alſo a town of Aſiatic Turky, fifty miles ſouth-eaſt of Conſtantinople.

NICHE, in architecture, a hollow ſunk into a wall, for the commodious and agreeable placing a ſtatue.

NICOBAR ISLANDS, a cluſter of iſlands ſituated in the Indian ocean, at the entrance of the gulph of Bengal, between 7° and 10° N. lat.

NICOLAITANS, in church-hiſtory, Chriſtian heretics who aſſumed this name from Nicolas of Antioch; who, being a Gentile by birth, firſt embraced Judaiſm, and then Chriſtianity; when his zeal and devotion recommended him to the church of Jeruſalem, by whom he was choſen one of the firſt deacons. Many of the primitive writers believe that Nicolas was rather the occaſion than the author of the infamous practices of thoſe who aſſumed his name, who were expreſsly condemned by the ſpirit of God himſelf, Rev. ii. 6. And indeed their opinions and actions were highly extravagant and criminal. They allowed a community of wives; made no difference between ordinary meats and thoſe offered to idols. According to Euſebius, they ſubſiſted but a ſhort time; but Tertullian ſays, that they only changed their name, and that their hereſies paſſed into the ſect of the Cainians.

St. NICOLAS, a town of Lorrain, ten miles ſouth-eaſt of Nancy, at the mouth of the river Dwina.

St. NICOLAS is alſo a port-town of Ruſſia ſituated on the White ſea, ſix miles below Archangel.

St. NICOLAS's DAY, a feſtival of the Romiſh church, obſerved on the 6th of December.

NICOMEDIA, a city of Aſiatic Turky, thirty miles ſouth eaſt of Conſtantinople.

NICOPOLIS, a city of European Turky, ſituated on the Danube, 100 miles north weſt of Adrianople: E. long. 25°, N. lat. 43°.

NICOPPING, a city of Sweden, in the province of Sunderland, fifty miles ſouth of Stockholm.

NICOPPING is alſo the capital of the iſland Hulſter, ſubject to Denmark, and forty-eight miles ſouth-weſt of Copenhagen.

NICOSIA, the capital of the iſland of Cyprus: E. long. 35°, N. lat. 35°.

NICOTERA, a port town of the kingdom of Naples, thirty miles north eaſt of Reggio.

NICOTIANA, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel ſhaped, with a plaited limbus; the ſtamina are inclined; and the capſule has two valves and two cells. There are 7 ſpecies, all natives of warm climates. The nicotiana tabacum, or tobacco, was firſt brought into Europe about the year 1560, from the iſland Tobago in America. It is cultivated in the following manner.

After ſowing the tobacco ſeeds, the ground is watered every day, and in hot weather covered to prevent its being ſcorched by the ſun; and when the plants are grown to a convenient pitch, they are tranſplanted into a ſoil well prepared for their reception: care is alſo taken to keep this ground clear of weeds, and to pull off the loweſt leaves of the plant, that ten or fifteen of the fineſt leaves may have all the nouriſhment. When theſe leaves are ripe, which is known by their breaking when bent, the ſtalks are cut, and left to dry two or three hours in the ſun; after which they are tied together two and two, and hung on ropes under a ſhade to be dried in the air. And when the leaves are ſufficiently dried, they are pulled from off the ſtalks, and made up in little bundles; which being ſteeped in ſea-water, or, for want thereof, in common water, are twiſted in manner of ropes, and the twiſts formed into rolls, by winding them with a kind of mill around a ſtick: in which condition it is imported into Europe, where it is cut by the tobacconiſts for ſmoaking, formed into ſnuff, and the like. See SNUFF.

Beſides the tobacco of the Weſt-Indies, there are conſiderable quantities cultivated in the Levant, the coaſts of Greece and the Archipelago, the iſland of Malta and Italy.

The marks of good twiſt-tobacco, are a fine ſhining cut, an agreeable ſmell, and that it have been well kept. Tobacco is either taken by way of ſnuff, as a ſternutatory; or as a maſticatory, by chewing it in the mouth; or by ſmoking it in a pipe. It is ſometimes alſo taken in little longiſh pellets put up the noſe, where it is found to produce very good effects, to attract a deal of water or pituita, unload the head, reſolve catarrhs, and make a free reſpiration; for the ſubtile parts of the tobacco in inſpiration, are carried into the trachea and lungs, where they looſen the peccant humours adhering thereto, and promote expectoration. Some have left this tobacco in their noſes all night; but this is found to occaſion vomiting the next morning. Another thing charged on this way of application, is, that it weakens the ſight. When taken in great quantities in the way of ſnuff, it is found to prejudice the ſmelling, greatly diminiſhes the appetite, and in time gives riſe to a phthiſis. That taken in the way of ſmoke, dries and damages the brain. Borrhi, in a letter to Bartholine, mentions a perſon who through exceſs of ſmoking had dried his brain to that degree, that after his death there was nothing found in his ſkull but a little black lump, conſiſting of mere membranes.

Some people uſe the infuſion of tobacco as an emetic; but it is a very dangerous and unjuſtifiable practice, and often produces violent vomiting, ſickneſs, and ſtupidity.

Bates and Fuller give ſome receipts, in which tobacco is an ingredient, with mighty encomiums in aſthmatic caſes. A ſtrong decoction of tobacco, with proper carminatives and cathartics, given clyſter-wiſe, ſometimes proves of good effect in what is uſually called the ſtone-cholic, and alſo in the iliac paſſion. A drop or two of the chymical oil of tobacco, being put on the tongue of a cat, produces violent convulſions, and death itſelf in the ſpace of a minute; yet the ſame oil uſed in lint, and applied to the teeth, has been of ſervice in the tooth-ach: though it muſt be to thoſe that have been uſed to the taking of tobacco; otherwiſe, great ſickneſs, reachings, vomitings, *&c.* happen; and even in no caſe is the internal uſe of it warranted by ordinary practice.

A ſtrong decoction of the ſtalks, with ſharp-pointed dock and alum, is ſaid to be of good ſervice, uſed externally, in cutaneous diſtempers, eſpecially the itch: ſome boil them for that purpoſe in urine. The ſame is ſaid to be infallible in curing the mange in dogs.

Beat into a maſh with vinegar, or brandy, it has been found ſerviceable for removing hard tumours of the hypochondria.

NICOYA, or *St* LUCAR, a port-town of Mexico, ſituated on a bay of the South Sea, in 88° W. long. and 10° 15′ N. lat.

NICTITATING MEMBRANE, a thin membrane, chiefly found in the bird and fiſh kind, which covers the eyes of theſe animals, ſheltering them from the duſt or too much light; yet is ſo thin and pellucid, that they can ſee pretty well through it.

NIDUS, among naturaliſts ſignifies a neſt, or proper repoſitory for the eggs of birds, inſects, *&c.* wherein the young of theſe animals are hatched and nurſed.

NIECE, a brother or ſiſter's daughter, which in the civil law is reckoned the third degree of conſanguinity.

NIEMEN, or BEREZINA, a river of Poland, which riſes in Lithuania, and falls into a bay of the Baltic ſea, near Memel.

NIEPER, or BORISTHENES, a river which riſes in the middle of Ruſſia; and running ſouth through Poland, enters

enters the Russian Ukrain, separates Little Tartary from Budziac Tartary, and falls into the Black Sea near Oczakow.

NIESTAT, a town of Lower Saxony, in the duchy of Mecklenburg: E. long. 11° 26′, N. lat. 53° 40′.

NIESTAT is also a town of Upper Saxony, in the marquisate of Brandenburg, 25 miles north-east of Berlin.

NIESTER, a river which rises in Poland, and running south east divides Podolia in Poland from Moldavia in Turky; and afterwards, dividing Bessarabia from Budziac Tartary, falls into the Black Sea near Belgorod.

NIGELLA, in botany, a genus of the polyandria pentagynia class. The calix is wanting; the corolla consists of five petals; there are five trifid nectaria within the corolla; and there are five connected capsules. The species are five, none of them natives of Britain.

NIGER, a great river of Africa, which runs from east to west through the middle of Negroland, and discharges itself into the Atlantic ocean by three channels, called Rio Grande, Gambia, and the river Senega. It is 300 miles between the northern and southern channels; and all the country between them is annually overflowed, as Egypt is by the Nile.

NIGHT, that part of the natural day during which the sun is underneath the horizon; or that space wherein it is dusky.

Night was originally divided by the Hebrews, and other eastern nations, into three parts, or watchings. The Romans, and afterwards the Jews from them, divide the night into four parts, or watches, the first of which began at sunset and lasted till nine at night, according to our way of reckoning; the second lasted till midnight; the third till three in the morning; and the fourth ended at sunrise. The ancient Gauls and Germans divided their time, not by days, but by nights; and the people of Iceland, and the Arabs, do the same at this day. The like is also observed of our Saxon ancestors.

NIGHT-MARE, in medicine. See MEDICINE, p. 157.

NIGHT-WALKERS. See NOCTAMBULI.

NIGHTINGALE, in ornithology. See MOTACILLA.

NIGRITIA. See NEGROLAND.

NILE, a great river in Egypt, having its source in Abyssinia, or the Upper Ethiopia, in 12° north lat. It generally runs from south to north through Abyssinia into Egypt, and then continues its course north in one stream till it comes below Cairo to the Delta, where it divides; one branch discharging itself into the Mediterranean at Damieta, and another a hundred miles to the westward of it at Rosetta. There are great rejoicings every year when the Nile rises to a certain height, their future harvest depending upon it. The just height of the inundation, according to Pliny, is sixteen cubits; when it arises but to twelve or thirteen, a famine is dreaded; and when it exceeds sixteen, there is also danger apprehended. The river begins usually to rise in May or June, and is conveyed by reservoirs, cisterns, and canals, to the fields and gardens as they want it.

As to the Delta, it is all overflowed.

NIMBUS, in antiquity, a circle observed on certain medals, or round the head of some emperors, answering to the circles of light, drawn around the images of saints.

NIMEGUEN, a city of the united Netherlands, situated on the river Waal, in the province of Guelderland, 52 miles south east of Amsterdam.

NIMETULAHITES, a kind of Turkish monks, so called from their founder Nimetulahi, famous for his doctrines and the austerity of his life.

NIMPO, a city and port-town of China, in the province of Chekiam: E. long. 122°, N. lat. 30°.

NINEVEH, an ancient city of Assyria, was situated on the eastern banks of the river Tygris, opposite to the place where Moussul now stands.

NINOVE, a town of the Austrian Netherlands, in the province of Flanders, situated on the river Dender, thirteen miles west of Brussels.

NIO, a small Turkish island in the Archipelago, situated north-west of Santorini, remarkable for little but the tomb of Homer, who is said to lie buried here.

NIORT, a town of France, in the province of Orleanois and territory of Poictou, situated on the river Seure, twenty eight miles north-east of Rochelle.

NIPHON, the largest of the Japan islands, situated in the Indian ocean about 130 miles east of China; being 600 miles long, and 150 broad, and containing 55 provinces.

NIPPERS, in the menage, are four teeth in the fore-part of a horse's mouth, two in the upper and two in the lower jaw. A horse puts them forth between the second and third year.

NIPPLES, in anatomy. See ANATOMY, p. 277.

NIPPLE WORT, in botany. See LAPSANA.

NISI PRIUS, in law, a judicial writ which lies in cases where the jury being impannelled and returned before the justices of the bank, one of the parties requests to have such a writ, for the ease of the country, in order that the trial may come before the justices in the same county on their coming thither. The purport of a writ of nisi prius is, that the sheriff is thereby commanded to bring to Westminster the men impanelled, at a certain day, before the justices, "nisi prius justiciarii domini regis ad assisas capiendas venerint."

NISMES, a fine city of France, in the province of Languedoc: E. long. 4° 26′, N. lat. 43° 40′.

NISNA, or NISE-NOVOGOROD, the capital of the province of Nise, or Little Novogorod, in Russia: E. long. 45°, N. lat. 56°.

NISSA, a city of European Turky, in the province of Servia: E. long 23°, N. lat. 43°.

NISSA or NIZZA, a town of Italy, in the duchy of Montferrat: E. long. 8° 40′, N. lat. 44° 45′.

NITHSDALE, a county of Scotland, bounded by Clydesdale on the north, by Annandale on the east, by Solway frith on the south, and by Galloway on the west.

NITRACHT, or NYTREA, a town of Hungary, forty miles north-east of Presburg.

NITRE, or SALT-PETRE. See CHEMISTRY, p. 73. 119.

NIUCHE,

NIUCHE, a kingdom of Chinesian Tartary, north of the province of Laotung.

NIVELLE, a town of the Austrian Netherlands, and province of Brabant, fourteen miles south of Brussels.

NIXABOUR, or NISABOUR, a city of Persia, in the province of Chorassan: E. long. 57° 32′, N. lat. 35° 40′.

NOBILIARY, in literary history, a book containing the history of the noble families of a nation, or province: such are Chorier's Nobiliary of Dauphine, and Caumartin's Nobiliary of Provence. The Germans are said to be particularly careful of their nobiliaries, in order to keep up the purity of their families.

NOBILITY, a quality that ennobles, and raises a person possessed of it above the rank of a commoner.

The origin of nobility in Europe is by some referred to the Goths; who, after they had seized a part of Europe, rewarded their captains with titles of honour, to distinguish them from the common people. In Britain the term nobility is restrained to degrees of dignity above knighthood; but every where else nobility and gentility are the same. The British nobility consists only of five degrees, *viz.* that of a duke, marquis, earl or count, viscount, and baron, each of which see under their proper articles.

NOBLE, a money of account containing six shillings and eight-pence.

The noble was anciently a real coin struck in the reign of Edward III. and then called the penny of gold; but it was afterwards called a rose-noble, from its being stamped with a rose: it was current at 6 s. 8 d.

NOCERA, a town of Italy, in the territory of the pope and duchy of Spoletto, twenty miles north-east of Spoletto.

Terra NOCERIANA, EARTH OF NOCERA, in the materia medica, a species of bole, remarkably heavy, of a greyish-white colour, of an insipid taste, and generally with some particles in it which grit between the teeth.

It is much esteemed, by the Italians, as a remedy for venemous bites, and in fevers; but, except its astringent quality, little dependence is to be had on the other virtues ascribed to it.

NOCTAMBULI, or NIGHTWALKERS, in medicine, a term applied to persons who have a habit of rising and walking about in their sleep.

NOCTILUCA, a species of phosphorus, so called because it shines in the night without any light being thrown upon it; such is the phosphorus made of urine. See CHEMISTRY, p. 123.

NOCTURNAL, something relating to the night, in contradistinction to diurnal.

NOCTURNAL, NOCTURLABIUM, an instrument chiefly used at sea, to take the altitude or depression of some stars about the pole, in order to find the latitude and hour of the night.

Some nocturnals are hemispheres, or planispheres, on the plane of the equinoctial. Those commonly in use among seamen are two; the one adapted to the polar star, and the first of the guards of the little bear; the other to the pole-star, and the pointers of the great bear.

This instrument consists of two circular plates, (Plate CXXXIV. fig. 2.) applied to each other. The greater, which has a handle to hold the instrument, is about 2½ inches diameter, and is divided into twelve parts, agreeing to the twelve months; and each month sub-divided into every fifth day; and so as that the middle of the handle corresponds to that day of the year wherein the star here regarded has the same right ascension with the sun. If the instrument be fitted for two stars, the handle is made moveable. The upper left circle is divided into twenty-four equal parts for the twenty four hours of the day, and each hour subdivided into quarters. These twenty four hours are noted by twenty four teeth to be told in the night. Those at the hours 12, are distinguished by their length. In the centre of the two circular plates is adjusted a long index, A, moveable upon the upper plate. And the three pieces, *viz.* the two circles and index, are joined by a rivet which is pierced through the centre with a hole, through which the star is to be observed.

To use the NOCTURNAL, turn the upper plate till the long tooth, marked 12, be against the day of the month on the under plate: then, bringing the instrument near the eye, suspend it by the handle with the plane nearly parallel to the equinoctial; and viewing the pole-star through the hole of the centre, turn the index about, till, by the edge coming from the centre, you see the bright star or guard of the little bear (if the instrument be fitted to that star:) then that tooth of the upper circle, under the edge of the index, is at the hour of the night on the edge of the hour circle: which may be known without a light, by counting the teeth from the longest, which is for the hour 12.

NODATED HYPERBOLA, a name given by Sir Isaac Newton, to a kind of hyperbola, which, by turning round, decussates or crosses itself.

NODE, a tumour arising on the bones, and usually proceeding from some venereal cause; being much the same with what is otherwise called exostosis.

NODES. See ASTRONOMY, p. 477.

NODUS, or NODE, in dialling, a certain point or pole in the gnomon of a dial, by the shadow or light whereof either the hour of the day in dials without furniture, or the parallels of the sun's declination, and his place in the ecliptic, *&c.* in dials with furniture, are shewn. See DIALLING.

NOETIANS, in church history, Christian heretics in the IIId century, followers of Noetius, a philosopher of Ephesus, who pretended that he was another Moses, sent by God; and that his brother was a new Aaron. His heresy consisted in affirming that there was but one person in the Godhead; and that the Word and the Holy Spirit were but external denominations, given to God, in consequence of different operations; that as Creator, he is called Father; as Incarnate, Son; and as descending on the apostles, Holy Ghost.

NOGAIAN TARTARS, a nation which inhabits that part of Circassia, in Asiatic Turky, that lies between the Palus Meotis and the Caspian sea.

NOGENT, a town of France, in the province of Champaign, situated on the river Seine, twenty five miles north-west of Troyes.

NOLA, a town of Italy, in the kingdom of Naples, situated 16 miles east of Naples.

NOLI, a town of Italy in the territory of Genoa, situated on the bay of Genoa, thirty five miles south west of that city.

NOMARCHA, in Egyptian antiquity, the governor or commander of a nome. Egypt was anciently divided into several regions or quarters, called nomes.

NOMBRE DE DIOS, a town of Mexico, in the province of Darien, a little to the eastward of Porto Bello: W. long. 83°, and N. lat. 10°.

NOMBRIL POINT, in heraldry, is the next below the fess point, or the very centre of the escutcheon. See POINT.

Supposing the escutcheon divided into two equal parts below the fess, the first of these divisions is the nombril, and the lower the base.

NOME, or NAME, in algebra, denotes any quantity with a sign prefixed or added to it, whereby it is connected with some other quantity, upon which the whole becomes a binomial, trinomial, or the like. See ALGEBRA.

NOMENCLATOR, in Roman antiquity, was usually a slave, who attended upon persons that stood candidates for offices, and prompted or suggested to them the names of all the citizens they met, that they might court them, and call them by their names; which, among that people, was the highest piece of civility.

NOMENCLATORES, among the botanical authors, are those who have employed their labours about settling and adjusting the right names, synonymes, and etymologies of names, in regard to the whole vegetable world.

NOMENCLATURE, a catalogue of several of the more usual words in any language, with their significations, compiled in order to facilitate the use of such words to those who are to learn the tongue: such are our Latin, Greek, French, *&c.* nomenclatures.

NOMINALS, NOMINALISTS, a sect of school philosophers, the disciples and followers of Occam, or Ocham, an English cordelier, in the XIVth century. They were great dealers in words, whence they were vulgarly denominated word-sellers; but had the denomination of nominalists, because that, in opposition to the realists, they maintained that words, and not things, were the object of dialectics.

NOMINATIVE, in grammar, the first case of nouns which are declinable. See GRAMMAR.

NONAGE, in law, generally signifies all the time a person continues under the age of one and twenty; but in a special sense, it is all the time a person is under the age of fourteen.

NON-CAPE, in geography, a promontory on the west coast of Africa, opposite to the Canary islands.

NON-ENTRY, in Scots law. See LAW, Tit. xii. 5.

NON-NATURALS, in medicine, so called because by their abuse they become the causes of diseases.

Physicians have divided the non-naturals into six classes, *viz.* the air, meats and drinks, sleep and watching, motion and rest, the passions of the mind, the retentions and excretions.

NON-SUIT, signifies the dropping of a suit or action, or a renouncing thereof by the plaintiff or defendant.

NONCONFORMISTS. See DISSENTERS.

NONE, one of the seven canonical hours in the Romish church, answering to three o'clock in the afternoon.

NONES, in the Roman kalendar, the fifth day of the months January, February, April, June, August, September, November, and December; and the seventh of March, May, July, and October. March, May, July, and October, had six days in their nones; because these alone, in the ancient constitution of the year by Numa, had thirty-one days a-piece, the rest having only twenty-nine, and February thirty: but when Cæsar reformed the year, and made other months contain thirty one days, he did not allot them six days of nones. See KALENDAR.

NORDEN, a port-town of Germany, in the circle of Westphalia, and county of Embden, twelve miles north of Embden.

NORFOLK, a county of England, bounded by the German sea on the north and east; by Suffolk on the south, and by the fens of Lincolnshire and the isle of Ely on the west.

NORFOLK, a county of Virginia, north of Carolina, and contiguous to that province.

NORMANDY, a province of France, bounded by the east channel on the north, by Picardy and the isle of France on the west, by Orleanois on the south, by Britany and another part of the east channel on the west.

NORROY, the title of the third of the three kings at arms.

NORTH, one of the four cardinal points. See NAVIGATION.

NORTH CURRY, a market-town of Somersetshire, seventeen miles south-west of Wells.

NORTH FORELAND, a cape in the isle of Thanet, on the east coast of Kent, four miles east of Margate.

NORTH SEA, a name given to all that part of the Atlantic Ocean which lies north of Terra Firma, in South America.

NORTH-WEST *passage*. A north-west passage by Hudson's Bay, into the pacific ocean, has been more than once attempted of late years, but hitherto without success. Some greatly doubt of the practicableness of such an enterprize, and think the observations made by the Russians give us small hopes. Some general things may be seen in the Phil. Transf. N° 482. sect. 14. It appears from thence, that the Russians have passed between the land of Nova Zembla, and the coast of Asia; and, as the Dutch did formerly discover the northern coasts of Nova Zembla, we may now be well assured that that country is really an island.

NORTHALLERTON, a borough-town of the north riding of Yorkshire, twenty-two miles north-west of York. It sends two members to parliament.

NORTHAMPTON, the capital of Northamptonshire, situated on the river Nen: W. long. 55′, and N. lat. 52° 15′. It sends two members to parliament.

NORTHAMPTON, is also a county of Virginia, in North America,

America, which forms the ſouth part of the peninſula on the eaſtern ſhore of Virginia.

NORTHAUSEN, a town of Germany in the circle of Upper Saxony, and territory of Thuringia, fifty-five miles ſouth-weſt of Magdeburg.

NORTHLEECH, a market town of Gloceſterſhire, fifteen miles eaſt of Gloceſter.

NORTHUMBERLAND, a county of England, bounded on the north by Scotland, on the eaſt by the German ſea, on the ſouth by Durham, and on the weſt by Cumberland and part of Scotland.

NORTHUMBERLAND is alſo a county of Virginia, lying at the mouth of the river Patowmac.

NORTHWICH, a market town of Cheſhire, ſixteen miles north-eaſt of Cheſter.

NORWAY, a kingdom of Europe, ſituated between 4° and 30° eaſt longitude, and between 58° and 72° north latitude, bounded by the Atlantic ocean on the north and weſt, by Swediſh Lapland and other provinces of Sweden on the eaſt, and by the ſea called the Categate and Schaggeric on the ſouth. It is a cold barren country, ſubject to Denmark.

NORWAY-RAT, in zoology. See MUS.

NORWICH, a large city of great trade in Norfolk, ſituated 20 miles weſt of Yarmouth and the German ocean: E. long. $1^{\circ}\ 26'$, and N. lat. $52^{\circ}\ 40'$. It ſends two members to parliament.

NOSE, in anatomy. See ANATOMY, p. 161, 162, 163, 293.

NOTARY, ſignifies a perſon, uſually ſome ſcrivener, who takes notes, or frames ſhort draughts, of contracts, obligations, charter-parties, or other writings. At preſent we call him a notary-public who publicly atteſts deeds, or writings, in order to make them authentic in another nation: but he is principally employed in buſineſs concerning merchants, as making proteſts of bills of exchange *&c.* And noting a bill, is where he goes to take notice of a merchant's refuſal to accept or pay the ſame.

NOTATION, in arithmetic. See ARITHMETIC, p. 366.

NOTES, in muſick, characters which mark the ſounds, *i. e.* the elevations and fallings of the voice, and the ſwiftneſs and ſlowneſs of its motions. See MUSICK.

NOTE is likewiſe uſed for a mark made in a book or writing where there occurs ſomething remarkable and worthy of particular notice: as alſo for an obſervation or explication of ſome paſſage in an author added in the margin, at the bottom of the page, or elſewhere, in which ſenſe it ſtands contradiſtinguiſhed to text.

NOTE, is alſo a minute, or ſhort writing, containing ſome article of buſineſs, in which ſenſe we ſay, promiſſary note, note of hand, bank note, *&c.*

NOTHUS, ſignifies ſpurious or baſtard; whence it is figuratively applied by phyſicians, *&c.* to ſuch diſeaſes as though in reſpect of a ſimilitude of ſymptoms, *&c.* they have the ſame denomination as ſome others, yet are of a different origin, ſeat, or the like, from the ſame.

NOTION, in logic, an idea or repreſentation of any thing in the mind. See LOGIC and METAPHYSICS.

NOTITIA, in literary hiſtory, a book that gives an account of a particular country, city, or other place: ſuch is the Notitia Imperii Romani, Notitia Romæ Antiquæ, *&c.*

NOTO, the capital of a province of the ſame name in Sicily, twenty miles ſouth of Syracuſe, E. long. 15°, N. lat. $37^{\circ}\ 15'$.

NOTONECTA, the BOAT-FLY a genus of inſects belonging to the order hemiptera. The beak is inflected; the antennæ are ſhorter than the thorax; the four wings are plaited croſs-ways; and the feet are hairy, and fitted for ſwimming. There are three ſpecies, diſtinguiſhed by their colour.

NOTTEBURG, a city of Ruſſia, ſituated on an iſland in the lake Lodoga, twenty five miles eaſt of Peterſburg.

NOTTINGHAM, the capital of Nottinghamſhire, ſituated about a mile north of the river Trent; W. long. $1^{\circ}\ 5'$, N. lat. 53°. It ſends two members to parliament.

NOVA-SCOTIA. See SCOTLAND.

NOVA-ZEMBLA, or Newland, called by the Dutch the iſland of Weygats, is ſituated in the frozen ocean, between 50° and 80° eaſt longitude, and between 70° north latitude and the north pole: it is ſeparated from the province of Samoida, in Ruſſia, by the ſtraits of Weygats.

NOVARA, the capital of the Novareſe, in the duchy of Milan, forty miles weſt of Milan.

NOVATIANS, a Chriſtian ſect which ſprang up in the third century, ſo called from Novatian a prieſt of Rome, or Novatus an African biſhop who ſeparated from the communion of pope Cornelius, whom Novatian charged with a criminal lenity towards thoſe who had apoſtatized during the perſecution of Decius. He denied the church's power of remitting mortal ſins, upon the offender's repentance; and at laſt went ſo far as to deny that the apoſtles could ever hope for pardon even from God himſelf.

NOVATION, or INNOVATION, in the civil law, denotes the change of one kind of obligation for another; as when a promiſe is accepted inſtead of a written obligation.

NOVATION, in Scots law. See LAW, Tit. xxiii. 7.

NOVEL, in matters of literature, a fictitious hiſtory of a ſeries of entertaining events in common life, wherein the rules of probability are or ought to be ſtrictly preſerved.

NOVELLARA, a town of Italy, in the duchy of Mantua, twenty miles ſouth of the city of Mantua.

NOVEMBER, in chronology, the eleventh month of the Julian year, conſiſting only of thirty days; it got the name of November, as being the ninth month of Romulus's year, which began with March.

NOVEMVIRI, the nine magiſtrates of Athens, more uſually called archons.

NOVIGRAD, a town of Dalmatia, in $17^{\circ}\ 30'$ E. long. and $44^{\circ}\ 30'$ N. lat.

NOUN, in grammar, a part of ſpeech, which ſignifies things without any relation to time; as a man, a houſe, ſweet, bitter, *&c.* See GRAMMAR.

NOVOGOROD, the capital of a province of the ſame name in Muſcovy, ſituated on the river Wolcoff, 130 miles

miles south east of Petersburg; E. long. 34°, N. lat. 58°.

It is an archbishop's see, and has 180 churches and monasteries.

NOVOGRODECK, a city of Lithuania, in Poland: E. long. 25° 30′, N. lat. 53° 45′.

NOURISHMENT. See NUTRITION.

NOWED, in heraldry, signifies knotted, from the Latin *nodatus*; being applied to the tails of such creatures as are very long, and sometimes represented in coat-armour, as if tied up in a knot.

NUBIA, a country of Africa, bounded by the desart of Barca, on the north; by Egypt and Abyssinia, on the east; by the Lower Ethiopia, on the south; and by the desarts of Africa, on the west.

NUCHA, the nape of the neck.

NUCIFEROUS TREES, such as bear nuts.

NUCIFRAGA, in ornithology. See CORVUS.

NUCLEUS, in general denotes the kernel of a nut, or even any seed inclosed within a husk.

The term nucleus is also used for the body of a comet, otherwise called its head. See ASTRONOMY, p. 444.

NUDITIES, in painting and sculpture, denotes those parts of an human figure which are not covered with any drapery; or those parts where the carnation appears.

NULLITY, in law, signifies any thing that is null or void: thus there is a nullity of marriage, where persons marry within the degrees, or where infants marry without consent of their parents or guardians.

NUMBER. See ARITHMETIC.

Golden NUMBER. See ASTRONOMY, p. 495.

NUMBER, in grammar, a modification of nouns, verbs, *&c.* to accommodate them to the varieties in their objects, considered with regard to number. See GRAMMAR.

NUMBERS, in poetry. See VERSIFICATION.

Book of NUMBERS, the fourth book of the Pentateuch, taking its denomination from its numbering the families of Israel.

A great part of this book is historical, relating to several remarkable passages in the Israelites march through the wilderness. It contains a distinct relation of their several movements from one place to another, or the two and forty stages through the wilderness, and many other things, whereby we are instructed and confirmed in some of the weightiest truths that have immediate reference to God and his providence in the world. But the greatest part of this book is spent in enumerating these laws and ordinances, whether civil or ceremonial, which were given to God, but not mentioned before in the preceding books.

NUMENIUS, in ornithology, a genus of birds of the order of the scolopaces; the beak of which is of a figure approaching to a cylindrical one; it is obtuse at the point, and is longer than the toes; the feet have each 4 toes, connected together. This genus comprehends the curlew, the woodcock, the great plover, and the snipe. See CURLEW, *&c.*

NUMERAL LETTERS, those letters of the alphabet which are generally used for figures; as I, one; V, five; X, ten; L, fifty; C, a hundred; D, five hundred; M, a thousand; *&c.*

NUMERATION, or NOTATION, in arithmetic. See ARITHMETIC, p. 366.

NUMERATOR *of a fraction*. See ARITHMETIC, p. 387.

NUMERICAL, NUMEROUS, or NUMERAL, something belonging to numbers; as numerical algebra is that which makes use of numbers, instead of letters of the alphabet. Also, numerical difference, is the difference whereby one individual is distinguished from another. Hence a thing is said to be numerically the same, when it is so in the strictest sense of the word.

NUMIDIA, in ornithology, a genus belonging to the order of gallinæ. On each side of the head there is a kind of coloured fleshy horn; and the beak is furnished with cere near the nostrils. There is but one species, a native of Africa.

NUMIDIA, the ancient name of Biledulgerid, in Africa.

NUMISMATOGRAPHIA, a term used for the description and knowledge of ancient medals and coins, whether of gold, silver, or brass.

NUMMUS, among the Romans, a piece of money otherwise called sestertius.

NUN, a woman, in several Christian countries, who devotes herself, in a cloister or nunnery, to a religious life.

There were women in the ancient Christian church who made public profession of virginity before the monastic life was known in the world, as appears from the writings of Cyprian and Tertullian. These, for distinction's sake, are sometimes called ecclesiastical virgins, and were commonly enrolled in the canon or matricula of the church. They differed from the monastic virgin chiefly in this, that they lived privately in their father's houses, whereas the others lived in communities: but their profession of virginity was not so strict as to make it criminal in them to marry afterwards if they thought fit. As to the consecration of virgins, it had some things peculiar in it; it was usually performed publicly in the church by the bishop. The virgin made a public profession of her resolution, and then the bishop put upon her the accustomed habit of sacred virgins. One part of this habit was a veil, called the sacrum velamen; another was a kind of mitre or coronet worn upon the head. At present, when a woman is to be made a nun, the habit, veil, and ring of the candidate are carried to the altar; and she herself, accompanied by her nearest relations, is conducted to the bishop, who, after mass and an anthem, the subject of which is, "that she ought to have her lamp lighted, because the bridegroom is coming to meet her," pronounces the benediction: then she rises up, and the bishop consecrates the new habit, sprinkling it with holy water. When the candidate has put on her religious habit, she presents herself before the bishop, and sings on her knees, *Ancilla Christi sum*, &c. then she receives the veil, and afterwards the ring, by which she is married to Christ; and lastly the crown of virginity.

ginity. When ſhe is crowned, an anathema is denounced againſt all who ſhall attempt to make her break her vows.

NUNCIO, or NUNTIO, an ambaſſador from the pope to ſome catholic prince or ſtate; or a perſon who attends on the pope's behalf at a congreſs, or an aſſembly of ſeveral ambaſſadors.

NUNCUPATIVE, in the ſchools, ſomething that is only nominal, or has no exiſtence but in name.

NUNCUPATIVE TESTAMENT, in Scots law. See LAW, Tit. xxviii. 2.

NUNDINAL, NUNDINALIS, a name which the Romans gave to the eight firſt letters of the alphabet, uſed in their kalendar.

This ſeries of letters, A, B, C, D, E, F, G. H, is placed and repeated ſucceſſively from the firſt to the laſt day of the year: one of theſe always expreſſed the market-days, or the aſſemblies called nundinæ, *quaſi novendinæ*, becauſe they returned every nine days. The country people, after working eight days ſucceſſively, come to town the ninth, to ſell their ſeveral commodities, and to inform themſelves of what related to religion and government. Thus the nundinal day being under A on the firſt, ninth, ſeventeenth, and twenty fifth days of January, *&c.* the letter day will be the nundinal letter of the year following. Theſe nundinals bear a very great reſemblance to the dominical letters, which return every eight days, as the nundinals did every nine.

NUPTIAL RITES, the ceremonies attending the ſolemnization of marriage, which are different in different ages and countries.

NURENBURG, the capital of a territory of the ſame name, in the circle of Franconia, in Germany: E. long. 11°, N. lat. 49° 30′.

NURSERY, in gardening, is a piece of land ſet apart for raiſing and propagating all ſorts of trees and plants, to ſupply the garden and other plantations. See GARDENING.

NUSANCE, in law, a thing done to the annoyance of another.

Nuſances are either public or private. A public nuſance is an offence againſt the public in general, either by doing what tends to the annoyance of all the king's ſubjects, or by neglecting to do what the common good requires: in which caſe all annoyances and injuries to ſtreets, high-ways, bridges, and large rivers, as alſo diſorderly ale houſes, bawdy-houſes, gaming-houſes, ſtages for rope-dancers, *&c.* are held to be common nuſances. A private nuſance is when only one perſon or family is annoyed, by the doing of any thing; as where a perſon ſtops up the light of another's houſe, or builds in ſuch a manner that the rain falls from his houſe upon his neighbour's.

NUT, among botaniſts, denotes a pericarpium of an extraordinary hardneſs, incloſing a kernel or ſeed.

NUTATION, in aſtronomy, a kind of tremulous motion of the axis of the earth, whereby, in each annual revolution, it is twice inclined to the ecliptic, and as often returns to its former poſition.

NUTMEG, the kernel of a large fruit, not unlike the peach.

The nutmeg is ſeparated from its inveſtient coat, the mace, before it is ſent over to us; except that the whole fruit is ſometimes imported in preſerve, by way of ſweetmeat, or as a curioſity. See MACE.

The nutmeg, as we receive it, is of a roundiſh or oval figure, of a tolerably compact and firm texture, but eaſily cut with a knife, and falling to pieces on a ſmart blow. Its ſurface is not ſmooth, but furrowed with a number of wrinkles, running in various directions, though principally longitudinally. It is of a greyiſh brown colour on the outſide, and of a beautiful variegated hue within, being marbled with brown and yellow variegations, running in perfect irregularity through its whole ſubſtance. It is very unctuous and fatty to the touch, when powdered; and is of an extremely agreeable ſmell, and of an aromatic taſte.

There are two kinds of nutmeg in the ſhops, the one called by authors the male, and the other the female. The female is the kind in common uſe, and is of the ſhape of an olive: the male is long and cylindric, and has leſs of the fine aromatic flavour than the other; ſo that it is much leſs eſteemed, and people who trade largely in nutmegs will ſeldom buy it. The longer male nutmeg, as we term it, is called by the Dutch the wild nutmeg. It is always diſtinguiſhable from the others, as well by its want of fragrancy, as by its ſhape: it is very ſubject to be worm-eaten, and is ſtrictly forbid, by the Dutch, to be packed up among the other, becauſe it will give occaſion to their being worm-eaten too, by the inſects getting from it into them, and breeding in all parts of the parcel.

The largeſt, heavieſt, and moſt unctuous of the nutmegs are to be choſen, ſuch as are of the ſhape of an olive, and of the moſt fragrant ſmell. The Dutch import them from the Eaſt-Indies.

Nutmeg is greatly uſed in our foods, and is of excellent virtues as a medicine; it is a good ſtomachic, it promotes digeſtion, and ſtrengthens the ſtomach. It alſo ſtops vomiting; is an excellent remedy in flatuſes; and is happily joined with rhubarb, and other medicines, in diarrhœas. It is obſerved to have a ſoporific virtue, and to exert it too ſtrongly, if taken in immoderate quantities. It has a conſiderable degree of aſtringency; and given, after toaſting before the fire till throughly dry and crumbly, it has been ſometimes known alone to cure diarrhœas.

NUTRITION, in the animal œconomy, is the repairing the continual loſs, which the different parts of the body undergo. The motion of the parts of the body, the friction of theſe parts with each other, and eſpecially the action of the air, would deſtroy the body entirely, if the loſs was not repaired by a proper diet, containing nutritive juices; which being digeſted in the ſtomach, and afterwards converted into chyle, mix with the blood, and are diſtributed through the whole body for its nutrition.

In young perſons, the nutritive juices not only ſerve to repair the parts that are damaged, but alſo to increaſe them, which is called growth.

In grown perſons, the cuticle is every where conſtantly deſquamating, and again renewing; and in the ſame manner the parts rubbed off, or otherwiſe ſeparated

rated from the fleshy parts of the body, are soon supplied with new flesh; a wound heals, and an emaciated person grows plump and fat.

Buffon, in order to account for nutrition, supposes the body of an animal, or vegetable, to be a kind of mould, in which the matter necessary to its nutrition is modelled and assimilated to the whole. But, continues he, of what nature is this matter, which an animal, or vegetable, assimilates to its own substance? What power is it that communicates to this matter the activity and motion necessary to penetrate this mould? and, if such a force exist, would it not be by a similar force that the internal mould itself might be reproduced?

As to the first question, he supposes that there exists in nature an infinite number of living organical parts, and that all organized bodies consist of such organical parts; that their production costs nature nothing, since their existence is constant and invariable; so that the matter which the animal, or vegetable, assimilates to its substance, is an organical matter, of the same nature with that of the animal, or vegetable, which consequently may augment its volume, without changing its form, or altering the quality of the substance in the mould.

As to the second question: There exist, says he, in nature, certain powers, as that of gravity, that have no affinity with the external qualities of the body, but act upon the most intimate parts, and penetrate them throughout, and which can never fall under the observation of our senses.

And, as to the third question, he answers, that the internal mould itself is reproduced, not only by a similar power, but it is plain that it is the very same power that causes the unfolding and reproduction thereof: for it is sufficient, proceeds he, that in an organized body that unfolds itself, there be some part similar to the whole, in order that this part may one day become itself an organized body, altogether like that of which it is actually a part.

NUX PISTACHIA. See PISTACHIA.

NUYS, a town of Germany, twenty miles north of Cologne.

NYBURG, a town of Denmark, situated at the east-end of the island of Funen, ten miles east of Odensee: E. long. 10°, N. lat. 55° 30′.

NYCHTHEMERON, the natural day, or day and night, which together always make twenty-four hours.

NYCTALOPIA, in medicine, a two-fold disorder of the eye, one of which is opposite to the other. In the first, the sight is best in the night, and in obscure places; whereas in a clear light their sight fails, so that they can hardly see any thing. In the other sort of nyctylopia, the patient can see nothing at all except in a clear and bright light.

NYCTANTHES, *Arabian* JASMINE, in botany, a genus of the diandria monogynia class. The calix and likewise the corolla consist of eight segments. There are five species, none of them natives of Britain.

NYCTICORAX, in ornithology. See ARDEA.

NYLAND, a province of Finland, situated on the gulph of Finland, west of the province of Carelia.

NYMPH, in mythology, an appellation given to certain inferior goddesses inhabiting the mountains, woods, waters, *&c.* See MYTHOLOGY.

NYMPH, among naturalists, that state of winged insects between their living in the form of a worm, and their appearing in the winged or most perfect state.

NYMPHÆ, in anatomy. See ANATOMY, p. 276.

NYMPHÆA, the WATER-LILY, in botany, a genus of the polyandria monogynia class. The corolla consists of many petals, and the calix of four or five leaves; and the berry has many cells. There are four species, two of which are natives of Britain, *viz.* the lutea, or yellow water-lily; and the alba, or white water-lily.

NYMPHEUM, in antiquity, a public hall, magnificently decorated, for entertainment, *&c.* and where those who wanted convenience at home held their marriage-feasts, whence the name.

NYONS, a town of Dauphiné, in France: E. long. 5° 6°, N. lat. 44° 28′.

NYSLOT, a town of Sweden in the province of Finland, sixty miles north of Wyburg: E. long. 29°, N. lat. 62°.

O.

OAK, in botany. See QUERCUS.

OAK *of Jerusalem*, in botany. See CHENOPODIUM.

OAKAM, old ropes untwisted, and pulled out into loose hemp, in order to be used in caulking the seams, tree-nails, and bends of a ship, for stopping or preventing leaks.

OAKHAMPTON, a borough of Devonshire, twenty miles west of Exter, which sends two members to parliament.

OAR, in navigation, a long piece of wood, made round where it is to be held in the hand, and thin and broad at the other end, for the easier cutting and resisting the water, and consequently moving the vessel, by rowing. Oars for ships are generally cut out of fir-timber; those for barges are made out of New-England, or Dantzick-rafters,

rafters; and thoſe for boats either out of Engliſh aſh, or fir-rafters from Norway.

OAT, in botany. See AVENA.

OATH, is a ſolemn affirmation, in which the perſons ſworn invoke the Almighty to witneſs that their teſtimony is true; renouncing all claim to his mercy, and calling for his vengeance, if it be falſe.

OBADIAH, or *the Prophecy of* OBADIAH, a canonical book of the Old Teſtament, which is contained in one ſingle chapter; and is partly an invective againſt the cruelty of the Edomites, who mocked and derided the children of Iſrael, as they paſſed into captivity, and with other enemies, their confederates, invaded and oppreſſed thoſe ſtrangers, and divided the ſpoil amongſt themſelves; and partly a prediction of the deliverance of Iſrael, and of the victory and triumph of the whole church over her enemies.

OBELISK, in architecture, a truncated, quadrangular, and ſlender pyramid, raiſed as an ornament, and frequently charged either with inſcriptions or hieroglyphics.

Obeliſks appear to be of very great antiquity, and to be firſt raiſed to tranſmit to poſterity precepts of philoſophy, which were cut in hieroglyphical characters: afterwards they were uſed to immortalize the great actions of heroes, and the memory of perſons beloved. The firſt obeliſk mentioned in hiſtory was that of Rameſes king of Egypt, in the time of the Trojan war, which was forty cubits high. Phius, another king of Egypt, raiſed one of forty-five cubits; and Ptolemy Philadelphus, another of eighty-eight cubits, in memory of Arſinoe. Auguſtus erected one at Rome in the Campus Martius, which ſerved to mark the hours on an horizontal dial, drawn on the pavement. They were called by the Egyptian prieſts the fingers of the ſun, becauſe they were made in Egypt alſo to ſerve as ſtyles or gnomons to mark the hours on the ground. The Arabs ſtill call them Pharaoh's needles: whence the Italians call them aguglia, and the French aiguilles.

OBERSTEIN, the capital of the county of the ſame name, in the Palatinate of the Rhine, thirty miles eaſt of Triers.

OBERWESEL, or WESEL, a town of Germany, in the electorate of Triers, thirty-ſeven miles north-eaſt of the city of Triers.

OBJECT, in philoſophy, ſomething apprehended, or preſented to the mind, by ſenſation or by imagination. See METAPHYSICS.

OBJECT-GLASS *of a teleſcope.* See OPTICS.

OBJECTION, ſomething urged to overthrow a poſition, or a difficulty raiſed againſt an allegation or propoſition of a perſon we are diſputing withal.

OBJECTIVE is uſed, in the ſchools, in ſpeaking of a thing which exiſts no otherwiſe than as an object known. The exiſtence of ſuch a thing is ſaid to be objective.

OBLATI, in church hiſtory, were ſecular perſons, who devoted themſelves and their eſtates to ſome monaſtery, into which they were admitted as a kind of lay brothers. The form of their admiſſion, was, putting the bell-ropes of the church round their necks, as a mark of ſervitude. They wore a religious habit, but different from that of the monks.

OBLATION, a ſacrifice, or offering made to God.

OBLIGATION, in Scots law. See LAW Tit. xx.

OBLIQUE, in geometry, ſomething aſlant, or that deviates from the perpendicular. Thus an oblique angle is either an acute or obtuſe one, *i. e.* any angle except a right one.

OBLIQUE CASES, in grammar, are all the caſes except the nominative.

OBLIQUE LINE, that which falling on another line, makes oblique angles with it, *viz.* one acute, and the other obtuſe.

OBLIQUE PLANES, in dialling, are thoſe which recline from the zenith, or incline towards the horizon. See DIALLING.

OBLIQUE SAILING, in navigation. See NAVIGATION.

OBLIQUITY *of the ecliptic.* See ASTRONOMY.

OBLIQUUS, in anatomy, a name given to ſeveral muſcles, particularly in the head, eyes, and abdomen. See ANATOMY, Part II.

OBLONG, in general, denotes a figure that is longer than broad: ſuch is a parallelogram, ellipſis, *&c.*

OBOLUS, in antiquity, an ancient Athenian coin.

Among ancient phyſicians, obolus likewiſe denoted a weight, equal to ten grains.

OBREPTITIOUS, an appellation given to letters patent, or other inſtruments, obtained of a ſuperior by ſurpriſe, or by concealing from him the truth.

OBSCURE, ſomething that is dark and reflects little light, or that is not clear and intelligible.

OBSECRATION, in rhetoric, a figure whereby the orator implores the aſſiſtance of God, or man.

OBSEQUIES, the ſame with funeral ſolemnities. See FUNERAL.

OBSERVATION, among navigators, ſignifies the taking the ſun's or the ſtar's meridian altitude, in order thereby to find the latitude.

OBSERVATORY, a place deſtined for obſerving the heavenly bodies; being generally a building erected on ſome eminence, covered with a terrace for making aſtronomical obſervations.

The more celebrated obſervatories are, 1. The Greenwich-obſervatory, built in 1676, by order of Charles II. at the ſolicitations of Sir Jonas Moor and Sir Chriſtopher Wren; and furniſhed with the moſt accurate inſtruments, particularly a noble ſextant of ſeven feet radius, with teleſcopic ſights.

2. The pariſh-obſervatory, built by the late Louis XIV. in the Fauxbourg St. Jaques.

It is a very ſingular, but withal a very magnificent building; the deſign of monſieur Perault: It is eighty feet high; and at top is a terras.

The difference in longitude between this and the Greenwich obſervatory is 2° 20′ weſt.

In it is a cave, or cellar, 170 feet deſcent, for experiments that are to be made far from the ſun, *&c.* particularly ſuch as relate to congelations, refrigerations, indurations, conſervations, *&c.*

3. Tycho Brahe's obſervatory, which was in the little

little island Ween, or Scarlet-island, between the coasts of Schonen and Zeland, in the Baltic.

It was erected and furnished with instruments at his own expence, and called by him Uraniburg.

Here he spent twenty years in observing the stars: the result is his catalogue.

4. Pekin observatory. Father Le Compte describes a very magnificent observatory, erected and furnished by the late emperor of China, in his capital, at the intercession of some Jesuits, missionaries, chiefly father Verbiest, whom he made his chief observer.

The instruments are exceedingly large; but the divisions less accurate, and the contrivance in some respects less commodious than those of the Europeans: the chief are, an armillary, zodiacal sphere, of six Paris feet diameter; an equinoctial sphere, of six feet diameter; an azimuthal horizon, six feet diameter; a large quadrant, six feet radius; a sextant, eight feet radius; and a celestial globe, six feet diameter.

OBSTRUCTION, in medicine, such an obturation of the vessels, as prevents the circulation of the fluids, whether of the sound and vital, or of the morbid and peccant kind, through them.

OBTURATOR, in anatomy. See ANATOMY, p 205.

OBTUSE, signifies blunt, dull, *&c.* in opposition to acute, sharp, *&c.* thus we say obtuse angle, obtuse-angled triange, *&c.*

OBULARIA, in botany, a genus of the didynamia angiospermia class. The calix has two segments; the corolla is campanulated, and divided into four segments; the capsule has one cell, two valves, and many seeds. There is but one species, a native of Virginia.

OBY, a great river of Russia, which rises in Kalmuck Tartary, and forms the boundary between Europe and Asia, till it falls into the frozen ocean, after it has run a course of above two thousand miles.

OCCIDENT, in geography, the westward quarter of the horizon, or that part of the horizon where the ecliptic, or the sun therein, descends into the lower hemisphere, in contradistinction to orient. Hence we use the word occidental, for any thing belonging to the west; as, occidental bezoard, occidental pearl, *&c.*

OCCIPITAL, in anatomy, a term applied to the parts of the occiput, or back part of the skull. See ANATOMY.

OCCIPITIS os, the OCCIPITAL BONE, in anatomy. See ANATOMY, p. 156.

OCCULT, something secret, hidden, or invisible. The occult sciences, are magic, necromancy, cabbala, *&c.*

OCCULT, in geometry, is used for a line that is scarce perceiveable, drawn with the point of the compasses, or a leaden pencil. These lines are used in several operations, as the raising of plans, designs of building, pieces of perspective, *&c.* They are to be effaced when the work is finished.

OCCULTATION, in astronomy, the time a star or planet is hid from our sight, by the interposition of the body of the moon, or of some other planet. See ASTRONOMY.

OCCUPANT, in law, the person that first seizes, or gets possession of a thing.

OCCUPATION, in a legal sense, is taken for use or tenure; as in deeds it is frequently said, that such lands are or lately were in the tenure or occupation of such a person. It is likewise used for a trade or mystery.

OCCUPIERS of WALLING, a term in the salt-works for the persons who are the sworn officers that allot in particular places what quantity of salt is to be made, that the markets may not be overstocked, and see that all is carried fairly and equally between the lord and the tenant.

OCEAN, in geography, that vast collection of salt and navigable waters, in which the two continents, the first including Europe, Asia, and Africa, and the last America, are inclosed like islands.

OCHLOCRACY, that form of government wherein the populace has the chief administration of affairs.

OCHNA, in botany, a genus of the polyandria monogynia class. The corolla consists of five petals, and the calix of five leaves; and the berry contains one seed. There are two species, both natives of the Indies.

OCHRE, in natural history, a genus of earths, slightly coherent, and composed of fine, smooth, soft, argillaceous particles, rough to the touch, and readily diffusible in water.

Ochres are of various colours, as red, yellow, blue, brown, green, *&c.*

OCYMUM, in botany, a genus of the didynamia gymnospermia class. The superior lip of the calix is round, and the inferior is divided into four segments. There are eight species, none of them natives of Britain.

OCKER, a river of Germany, which, rising in the southern part of the duchy of Brunswick, runs north; and passing by Wolfembuttle and Brunswick, falls into the river Aller.

OCKINGHAM, a market-town of Berkshire, seven miles east of Reading.

OCTAETERIDES, in chronology, denotes a cycle of eight years, at the end of which three entire lunar months were added.

This cycle was in use at Athens, till Meton discovered the golden number.

OCTAGON, or OCTOGON, in geometry, is a figure of eight sides and angles; and this, when all the sides and angles are equal, is called a regular octagon, or one which may be inscribed in a circle.

OCTAGON, in fortification, denotes a place that has eight bastions. See FORTIFICATION.

OCTAHEDRON, or OCTAEDRON, in geometry, one of the five regular bodies, consisting of eight equal and equilateral triangles.

OCTANDRIA, in botany, one of the classes of plants established by Linnæus, the eighth in order. See BOTANY.

OCTANT, or OCTILE, in astronomy, that aspect of two planets, wherein they are distant an eighth part of a circle, or 45° from each other.

OCTAPLA, in matters of sacred literature, denotes a polyglot bible, consisting of eight columns, and as many different versions of the sacred text; *viz.* the original

ginal Hebrew both in Hebrew and Greek characters, Greek versions, &c.

OCTATEUCH, an appellation given to the eight first books of the Old Testament.

OCTAVE, in musick, an harmonical interval, consisting of seven degrees, or lesser intervals. See MUSICK.

OCTOBER, in chronology, the tenth month of the Julian year, consisting of thirty-one days: it obtained the name of October from its being the eighth month in the kalendar of Romulus.

OCTOSTYLE, in the ancient architecture, is the face of an edifice adorned with eight columns.

OCULUS, the eye, in anatomy. See ANATOMY, p. 289.

OCULUS BELI, in natural history, one of the semi-pellucid gems, of a greyish white colour, variegated with yellow, and with a black central nucleus: it is of a roundish form, and its variegations very beautifully represent the pupil and iris of the eye; whence the name.

OCULUS MUNDI, one of the semi-pellucid gems, of a whitish-grey colour, without any variegations.

OCZAKOW, a port-town of European Turky, the capital of Budziac Tartary: E. long. 35°, N. lat. 46°.

ODA, in the Turkish seraglio, signifies a class, order, or chamber. The grand seignior's pages are divided into five classes or chambers. The first, which is the lowest in dignity, is called the great oda, from the great number of persons that compose it: these are the juniors, who are taught to read, write, and speak the languages. The second, is called the little oda; where from the age of fourteen or fifteen years, till about twenty, they are trained up to arms, and the study of all the polite learning the Turks are acquainted with. The third chamber, called kilar oda, consists of two hundred pages, which, besides their other exercises, are under the command of the kilardgi-bachi, and serve in the pantry and fruitery. The fourth consists only of twenty four, who are under the command of the khazineda-bachi, and have charge of the treasure in the grand seignior's apartment, which they never enter with cloaths that have pockets. The fifth is called kas-oda, or privy-chamber, and is composed of only forty pages, who attend in the prince's chamber. Every night eight of these pages keep guard in the grand seignior's bed chamber, while he sleeps: they take care that the light, which is constantly kept in the room, does not glare in his eyes, lest it should awake him; and if they find him disturbed with troublesome dreams, they cause him to be awaked by one of their agas.

ODA-BACHI, or ODDOBASSI, among the Turks, an officer equivalent to a serjeant or corporal among us.

ODE, in poetry, a song, or a composition proper to be sung.

Among the ancients, odes signified no more than songs; but with us they are very different things. The ancient odes were generally composed in honour of their gods, as many of those of Pindar and Horace.

These had originally but one stanza, or strophe; but afterwards they were divided into three parts, the strophe, the antistrophe, and the epode. The priests going round the altar singing the praises of the gods, called the first entrance, when they turned to the left, the strophe; the second, turning to the right, they called antistrophe, or returning; and, lastly, standing before the altar, they sung the remainder, which they called the epode.

Heroes and triumphs were also subjects for the ode; and in course of time love and entertainments were likewise thought very suitable to it. Here Anacreon and Sappho excelled, and Horace has lost us some of both sorts wrote with peculiar sweetness and elegance. Among the moderns, Dryden's ode on St Cecilia's day, and Pope's on the same subject, are justly allowed to exceed every thing of the kind, either in this, or in any of the modern languages.

ODENSEE, the capital of Funen, one of the largest of the Danish islands in the Baltic, situated seventy-two miles west of Copenhagen.

ODER, a river which rises in the Carpathian mountains, on the confines of Hungary; runs through Silesia and Brandenburgh; and then separating the eastern from the western Pomerania, divides itself into several channels, and falls into the Baltic sea.

ODER is also a town of Silesia, situated on the river of the same name: E. long. 17° 17′, N. lat. 49° 45′.

ODERBERG, a town in the duchy of Silesia, in Bohemia, situated on the river Oder: E. long. 17° 45′, N. lat. 50° 6′.

ODERNHEIM, a town of Germany, in the palatinate of the Rhine, fifteen miles south of Mentz.

ODEUM, in Grecian antiquity, a musick-theatre, built by Pericles, the inside of which was filled with seats and ranges of pillars; and on the outside the roof descended shelving downwards from a point in the centre, with many bendings, in imitation of the king of Persia's pavilion. Here the musical prizes were contended for; and here also, according to Aristophanes, was a tribunal.

ODIHAM, a market-town of Hampshire, twenty miles north-east of Winchester.

ODONTALGIA, the TOOTH ACH, in medicine. See MEDICINE.

ODONTOIDE, in anatomy, an appellation given to a process of the second vertebra of the neck, from its resemblance to a tooth.

ODOROUS, or ODORIFEROUS, appellations given to whatever smells strongly, whether they be fetid or agreeable; but chiefly to things whose smell is brisk, and agreeable.

ODYSSEY, a celebrated epic poem of Homer, wherein are related the adventures of Ulysses in his return from the siege of Troy.

OECONOMICS, the art of managing the affairs of a family, or community; and hence the person who takes care of the revenues and other affairs of churches, monasteries, and the like, is termed oeconomus.

OECONOMY, denotes the prudent conduct, or discreet and frugal management, whether of a man's own estate, or that of another.

Animal OECONOMY, comprehends the various operations of

of nature, in the generation, nutrition, and preservation of animals. See GENERATION, NUTRITION, &c.

The doctrine of the animal oeconomy is nearly connected with physiology, which explains the several parts of the human body, their structure, use, &c. See ANATOMY.

OECUMENICAL, signifies the same with general, or universal; as oecumenical council, bishop, &c.

OEDEMA, in medicine and surgery. See MEDICINE and SURGERY.

OEDENBURG, or EDENBURG, a town of Hungary, thirty miles south of Vienna.

OELAND, a Swedish island in the Baltic sea, between the continent of Gothland, and the isle of Gothland: E. long. 16°, N. lat. between 56° and 57° 30′.

OELFELD, a town in the duchy of Magdeburg and circle of Lower Saxony in Germany, twenty miles east of Brunswick.

OENANTHE, in botany, a genus of the pentandria digynia class. The floscules are sessile, dissimilar, and barren in the disk; and the fruit is crowned with a calix. There are five species, three of them natives of Britain, *viz.* the fistulosa, or water-dropwort; the pimpinelloides, or pimpernel-dropwort; and the crocata, or yellow dropwort.

OENANTHE, in ornithology, a species of motacilla. See MOTACILLA.

OENAS. See COLUMBA.

OENOPTÆ, in Grecian antiquity, a kind of censors at Athens, who regulated entertainments, and took care that none drank too much or too little.

OENOTHERA, in botany, a genus of the octandria monogynia class. The calix consists of four segments, and the corolla of four petals; the capsule is cylindrical, and the seeds are naked. There are seven species, none of them natives of Britain.

OESEL, an island at the entrance of the bay of Livonia, in the Baltic sea; situated in 22° of E. long. and 58° of N. lat.

OESOPHAGUS, in anatomy. See ANATOMY, p. 282.

OESTRUS, in zoology, a genus of insects belonging to the order of diptera. It has no mouth, but the point appears in place of it, without any proboscis or snout. There are five species, distinguished by their colour.

OETING, the capital of the county of the same name, in the circle of Swabia, in Germany: E. long. 10° 35′, and N. lat. 49′.

OFFENBURG, a free imperial city of the circle of Swabia, in Germany, situated on the river Kintzig: E. long. 7° 40′, and N. lat. 48° 30′.

OFFENCE in law, an act committed against the law, or omitted where the law requires it.

OFFICE, a particular charge or trust, or a dignity attended with a public function. The word is primarily used in speaking of the offices of judicature and policy; as the office of a secretary of state, the office of a sheriff, of a justice of peace, &c.

OFFICE also signifies a place or apartment appointed for officers to attend in, in order to discharge their respective duties and employments: as the secretary's office, office of ordnance, excise-office, signet office, paper-office, pipe-office, six-clerks office, &c.

OFFICE, in architecture, denotes all the apartments appointed for the necessary occasions of a palace or great house, as kitchens, pantries, confectionaries, &c.

OFFICE, in the canon-law, is used for a benefice that has no jurisdiction annexed to it.

OFFICER, a person possessed of a post or office. See the preceding article.

Commission-OFFICERS, are those appointed by the king's commission: such are all from the general to the cornet inclusive, who are thus denominated in contradistinction to warrant-officers, who are appointed by the colonel's or captain's warrant, as quarter-masters, serjeants, corporals, and even chaplains and surgeons.

Field OFFICERS are such as command a whole regiment, as the colonel, lieutenant-colonel, and major.

Flag OFFICERS. See FLAG-OFFICERS, and ADMIRAL.

General-OFFICERS are those whose command is not limited to a single company, troop, or regiment; but extends to a body of forces, composed of several regiments; such are the general, lieutenant-general, major-generals, and brigadiers.

OFFICERS *of the household*. See HOUSEHOLD.

Staff-OFFICERS are such as, in the king's presence, bear a white staff, or wand; and at other times, on their going abroad, have it carried before them by a footman bare-headed: such are the lord steward, lord chamberlain, lord treasurer, &c.

The white staff is taken for a commission, and at the king's death each of these officers breaks his staff over the hearse made for the king's body, and by this means lays down his commission, and discharges all his inferior officers.

Subaltern-OFFICERS are all who administer justice in the name of subjects; as those who act under the earl marshal, admiral, &c. In the army, the subaltern officers are the lieutenants, cornets, ensigns, serjeants, and corporals.

OFFICIAL, in the canon-law, an ecclesiastical judge, appointed by a bishop, chapter, abbot, &c. with charge of the spiritual jurisdiction of the diocese.

OFFICIAL, is also a deputy appointed by an archdeacon, as his assistant, who sits as judge in the archdeacon's court.

OFFICINAL, in pharmacy, an appellation given to such medicines, whether simple or compound, as are required to be constantly kept in the apothecaries shops.

OFFIDA, a town of Italy subject to the pope, twenty-six miles south of Loretto.

OFFING, or OFFIN, in the sea-language, that part of the sea a good distance from shore, where there is deep water, and no need of a pilot to conduct the ship: thus, if a ship from shore be seen sailing out to seaward, they say, she stands for the offing: and if a ship having the shore near her, have another a good way without her, or towards the sea, they say, that ship is in the offing.

OFF-SETS, in gardening, are the young shoots, that spring

ſpring from the roots of plants; which being carefully ſeparated, and planted in a proper ſoil, ſerve to propagate the ſpecies.

OFF SETS, in ſurveying, are perpendiculars let fall, and meaſuring from the ſtationary lines to the hedge, fence, or extremity of an encloſure.

OGEE, or O. G. in architecture, a moulding conſiſting of two members, the one concave, and the other convex; or of a round and a hollow, like an S. See ARCHITECTURE.

OGIVE, in architecture, an arch, or branch of a gothic vault; which, inſtead of being circular, paſſes diagonally from one angle to another, and forms a croſs with the other arches.

OGLIO, a river which riſes in the alps, in the county of Trent, and, after running ſouthward through the lake Iſco and duchy of Mantua, falls into the Po a little weſt of Borgoforte.

OHIO, a large river of North America, which, taking its riſe in the mountains of Penſylvania, runs ſouth-weſt; and, after receiving many conſiderable branches, falls into the Meſſaſſippi.

OIL. See CHEMISTRY, p. 92, *&c.*

OINTMENT, in pharmacy. See UNGUENT.

OSIANS, a town of France, in the province of Dauphiné, eighteen miles ſouth-eaſt of Grenoble.

OKEHAM, the capital of Rutlandſhire, fourteen miles eaſt of Leiceſter: W. long. 45′, and N. lat. 52° 40′.

OLAX, in botany, a genus of the triandria monogynia claſs. The corolla is entire; the calix is funnel-ſhaped, and divided into three ſegments; and the nectarium conſiſts of four leaves. There is but one ſpecies, a native of Ceylon.

OLDENBURG, the capital of the county of the ſame name in Weſtphalia: E. long. 7° 32′, and N. lat. 53° 35′.

OLDENDORP, a town of Germany in the circle of Weſtphalia, thirty miles ſouth-weſt of Hanover.

OLDENLANDIA, a genus of the tetrandria monogynia claſs. The corolla conſiſts of four leaves, and the calix of four ſegments; and the capſule has two cells, and many ſeeds. There are four ſpecies, none of them natives of Britain.

OLDENZEL, a city of the United Netherlands, in the province of Overyſſel: E. long. 6° 50′, and N. lat. 52° 30′.

OLD-WIFE-FISH. See BALISTES.

OLEA, in botany, a genus of the diandria monogynia claſs. The corolla has four ſegments, with oval laciniæ; and the drupa contains one ſeed. There are two ſpecies.

This tree grows in the ſouthern parts of France, in Spain, Italy, and other warm countries: with us it is uſually preſerved in the green-houſes of the curious; though it will bear our ordinary winters in the open air, and produce very good fruit. Olives have an acrid, bitter, extremely diſagreeable taſte: pickled (as we receive them from abroad) they prove leſs diſagreeable. The Lucca olives, which are ſmaller than the others, have the weakeſt taſte; the Spaniſh, or larger, the ſtrongeſt; the Provence, which are of a middling ſize, are generally the moſt eſteemed.

The oil obtained from this fruit has no particular taſte or ſmell, and does not greatly differ in quality from oil of almods. Authors make mention of two ſorts of this oil, one expreſſed from the olives when fully ripe, which is our common oil olive; the other, before it has grown ripe; this is called *oleum immaturum*, and *omphacinum*. Nothing is met with in the ſhops under this name; and Lemery affirms, that there is no ſuch oil, unripe olives yielding only a viſcid juice to the preſs. From the ripe fruit, two or three ſorts are obtained, differing in degree of purity; the pureſt runs by light preſſure; the remaining magma, heated and preſſed more ſtrongly, yields an inferior ſort, with ſome dregs at the bottom, called *amurca*. All theſe oils contain a conſiderable portion of aqueous moiſture, and a mucilaginous ſubſtance; which ſubject them to run into a putrid ſtate; to prevent this, the preparers add ſome ſea ſalt, which imbibing the aqueous and mucilaginous parts, ſinks with them to the bottom; by this means the oil becomes more homogene, and conſequently leſs ſuſceptible of alteration. In its paſſage to us, ſome of the ſalt, thrown up from the bottom by the ſhaking of the veſſel, is ſometimes mixed with and detained in the oil, which, in our colder climate, becomes too thick to ſuffer it freely to ſubſide; and hence the oil is ſometimes met with of a manifeſtly ſaline taſte Oil-olive is uſed in the ſimple balſam of ſulphur, Locatellie's balſam, and ſeveral ointments. It is oftner employed in this laſt intention than the other expreſſed oils, but more rarely for internal medicinal purpoſes.

OLEAGINOUS, ſomething that partakes of the nature of oil, or out of which oil may be expreſſed.

OLECRANUM, or OLECRANON, in anatomy. See ANATOMY, p. 178.

OLERON, an iſland of France, near the coaſt of Poictou, fourteen miles ſouth-weſt of Rochelle, being about fifteen miles long, and ſix broad.

Sea-laws of OLERON, certain laws relating to maritime affairs, made in the time of Rich. I. when he was at the iſland Oleron.

Theſe laws, being accounted the moſt excellent ſea-laws in the world, are recorded in the black book of the admiralty.

OLESCO, a town of upper Volhinia, in Poland: eaſt longitude 24°, and north latitude 50°.

OLFACTORY NERVES. See ANATOMY, p. 248.

OLIBANUM, FRANK-INCENSE, in pharmacy, a dry reſinous ſubſtance, brought to us in detached pieces, or drops as it were, like thoſe of maſtic; but larger, and of a leſs pure and pellucid texture.

It is of a pale yellowiſh white colour, but with ſome mixture of a browniſh caſt in it. It is moderately heavy; its ſmell is ſtrong, but not diſagreeable; and its taſte bitter, acrid, and reſinous.

Olibanum is to be choſen whitiſh, pure, dry, and as much approaching to pellucidity as may be.

Olibanum is greatly commended by many againſt diſorders of the head and breaſt, and againſt diarrhœas and

and dyſenteries, and profluvia of the menſes, and the fluor albus. Its doſe is from ten grains to a drachm. It is eſteemed by many a ſpecific in pleuriſies, eſpecially when epidemic.

Externally it is uſed in fumigations for diſorders of the head, and againſt catarrhs; and is an ingredient in ſome plaſters. It is a noble balſam in conſumptions, given in ſubſtance, or diſſolved with the yolk of an egg into the form of an emulſion. There is an oil made of it per deliquium, in the ſame manner as that of myrrh: this is done by putting the powder of it in the white of a boiled egg, in a cellar, till it runs into a liquor; this is eſteemed a great coſmetic, and deſtroyer of pimples in the face.

OLIGAEDRA, in natural hiſtory, the name of a genus of cryſtals, and expreſſes that which is compoſed of only a few planes.

The bodies of this claſs are cryſtals of the imperfect kind, being compoſed of columns affixed irregularly to ſome ſolid body at one end, and the other terminated by a pyramid; but the column and pyramid being both pentangular, the whole conſiſts only of ten planes, and not, as the common kind, of twelve.

OLIGARCHY, a form of government, wherein the adminiſtration of affairs is lodged in the hands of a few perſons.

OLINDA, a city and port-town of Braſil: weſt long. 35°, and ſouth lat. 8°.

OLIO, in cookery, denotes a favoury diſh compoſed of a great variety of ingredients, chiefly uſed by the Spaniards.

OLIVA, a port-town of Poland, in the province of regal Pruſſia, only ſix miles weſt of Dantzick.

OLIVARIA CORPORA, in anatomy. See ANATOMY, p. 287.

OLIVE, in botany. See OLEA.

OLIVE-COLOUR, a yellow mingled with black. See OPTICS.

OLIVENZA, a town of Alentejo, in Portugal, ten miles ſouth of Elvas.

OLMUTS, a city of Moravia, ſeventy-five miles north of Vienna.

OLYMPIA, a port-town of the Morea, at preſent called Longinico: eaſt long. 21° 35′, and north lat. 37° 40′.

OLYMPIAD, the ſpace or period of four years, whereby the Greeks reckoned time. See ASTRONOMY, p. 493.

OLYMPIC GAMES were ſolemn games, famous among the ancient Greeks, ſo called from Olympian Jupiter, to whom they were dedicated; and by ſome ſaid to be firſt inſtituted by Jupiter, after his victory over the ſons of Titan; others aſcribe their inſtitution to Hercules, not the ſon of Alcmena, but one of much greater antiquity; others, to Pelops; and others, to Hercules the ſon of Alcmena. Theſe games were ſo conſiderable, that the Greeks made them their epocha, diſtinguiſhing their years by the return of the olympics.

The care and management of theſe games belonged, for the moſt part, to the Eleans, who, on that account, enjoyed their poſſeſſions without moleſtation, or fear of war or violence. They appointed a certain number of judges, who were to take care that thoſe who offered themſelves as competitors performed their preparatory exerciſes; and theſe judges, during the ſolemnity, ſat naked, having before them a crown of victory, formed of wild-olive, which was preſented to whomſoever they adjudged it. Thoſe who were conquerors, were called Olympionices, and were loaded with honours by their countrymen. At theſe games women were not allowed to be preſent; and if any woman was found to have paſſed the river Alpheus, during the ſolemnity, ſhe was to be thrown headlong from a rock.

OLYMPUS, the name of two mountains, the one in Bythinia in the Leſſer Aſia, and the other in the iſland of Cyprus.

OMAN, a province or kingdom in the ſouth-eaſt parts of Arabia Felix.

OMBRE, a celebrated game at cards, borrowed from the Spaniards, and played by two, by three, or by five perſons, but generally by three.

OMBRE DE SOLEIL, SHADOW OF THE SUN, in heraldry, is when the ſun is borne in armory, ſo as that the eyes, noſe, and mouth, which at other times are repreſented, do not appear; and the colouring is thin, ſo that the field can appear through it.

OMBRIA, the ancient name of a province of Italy, in the territory of the pope, now called Spoletto and Perugia.

OMBRO, or LOMBRO, a town of Italy, in the duchy of Tuſcany, and territory of the Siennois, ſituated near the Tuſcan ſea, a little ſouth of the lake of Caſtiglion, forty-five miles ſouth-weſt of Sienna.

OMELET, or AMLET, a kind of pancake or fricaſſee of eggs, with other engredients, very uſual in Spain and France.

OMEN, a certain accident and caſual occurrence that was thought to preſage either good or evil. There were three ſorts of omens among the ancients. One was of things internal, or thoſe which affected the perſons themſelves; the ſecond, of things external, that only appeared to men, but did not make any impreſſion on them; the third were ominous words. Of the firſt ſort were thoſe ſudden conſternations, called panic fears, that ſeized upon men without any viſible cauſe, and were therefore imputed to the dæmons, eſpecially the god Pan: of theſe panics there is frequent mention in hiſtory. The ſecond ſort of omens were of ſuch things as appeared to men, but were not contained in their own bodies. Of theſe there were ſeveral ſorts: the beginning of things were thought to contain ſomething ominous: it was thought a direful omen, when any thing unuſual befel the temples, altars, or ſtatues of the gods. Under the head of external omens are to be placed thoſe which offered themſelves in the way; ſuch were the meeting of an eunuch, a black, a bitch with whelps, a ſnake lying in the road, *&c.* Words were ominous; and as they were good or bad, were believed to preſage accordingly.

OMENTUM, in anatomy. See ANATOMY. p. 266.

OMERS,

OMERS, or St. OMERS, a city of Artois, in the French Netherlands, twenty miles fouth of Dunkirk, and eighteen fouth-eaft of Calais.

OMLANDS, a divifion of the province of Groningen, in the United Provinces.

OMMEN, a town of the United Netherlands, in the province of Overyffel, fituated on the leffer Vecht, feventeen miles north-eaft of Deventer.

OMOPHAGIA, an ancient Greek feftival, in honour of Bacchus, furnamed Omophagos, *i. e.* eater of raw flefh. This feftival was obferved in the fame manner with the other feftivals of Bacchus, in which they counterfeited madnefs; what was peculiar to it, was that the worfhipers ufed to eat the entrails of goats, raw and bloody, in imitation of the god, who was fuppofed to do the fame thing.

OMOPLATE, in anatomy. See ANATOMY, p 176.

OMPHALO-MESENTERIC, in anatomy. All fœtufes are wraped up in at leaft two coats or membranes; moft of them have a third, called allantoides, or urinary.

Some, as the dog, cat, hare, *&c.* have a fourth, which has two blood-veffels, *viz.* a vein and an artery, called omphalo-mefenterics, becaufe paffing along the ftring to the navel, and terminating in the mefentery.

ONANDAGOES, one of the tribes of the Iroquois, or Five Nations, fituated on the lake Ontario, or Frontenac, in North America: they are allies of Great Britain.

ONANIA, or ONANISM, terms which fome late empirics have framed, to denote the crime of felf-pollution, mentioned in fcripture to have been practifed by Onan, and punifhed in him with death.

ONEGA-LAKE, a lake upwards of an hundred miles long, and forty broad, fituated in the empire of Ruffia between 61° and 63° of north lat. and 35° eaft longitude.

ONEGLIA, a port town of Italy, feventy miles fouthweft of Genoa, fubject to the king of Sardinia: E. long. 8° 30′, and north lat. 44°.

ONEIROCRITICA, the art of interpreting dreams, or predicting future events from dreams.

ONGAR, a market town of Effex, ten miles weft of Chelmsford.

ONGLE'E, in heraldry, an appellation given to the talons or claws of beafts or birds, when borne of a different colour from that of the body of the animal.

ONION. See CEPA.

ONISCUS, in zoology, a genus of infects, belonging to the order of aptera. It has 14 feet, briftly feelers, and an oval body. There are 17 fpecies

ONKOTOMY, in furgery, the operation of opening a tumour or abfcefs. See SURGERY.

ONOCLEA, in botany, a genus of the cryptogamia filices clafs: the fruit confifts of feveral globular capfules, with five valves and one cell, in which are feveral fmall hairy feeds.

ONOCROTALUS, in ornithology. See PELICANUS.

ONOMANCY, a branch of divination, which foretels the good or bad fortune of a man, from the letters in his name.

From much the fame principle the young Romans toafted their miftreffes as often as there were letters in their names: hence Martial fays,

Nævia fex cyathis, feptem Juftina bibatur.

ONOMATOPOEIA, in grammar and rhetoric, a figure where words are formed to refemble the found made by the things fignified; as the buz of bees, the cackling of hens, *&c.*

ONONIS, in botany, a genus of the diadelphia decandria clafs. The calix has five fegments; the vexillum is ftriated; and the pod is feffile and turgid. There are 19 fpecies, three of them natives of Britain, *viz.* the fpinofa, or reft-harrow; the arvenfis, or corn reftharrow: and the repens, or creeping reft-harrow.

ONOPORDUM, a genus of the fyngenefia polygamia æqualis clafs. The receptacle is naked, and the fcales of their calix are fharp-pointed. There are four fpecies, none of them natives of Britain.

ONTARIO, or FRONTENAC, a lace of North America: fituated in W. long. 79°, and between 41° and 43° N. lat.

ONTOLOGY. See METAPHYSICS.

ONYX, in natural hiftory, one of the femipellucid gems, with varioufly coloured zones, but none red; being compofed of cryftal, debafed by a fmall admixture of earth; and made up either of a number of flat plates, or of a feries of coats furrounding a central nucleus, and feparated from each other by veins of a different colour, refembling zones or belts.

We have four fpecies of this gem. 1. A bluifh white one, with broad white zones. 2. A very pure onyx, with fnow-white veins. 3. The jafponyx, or horny onyx, with green zones. 4. The brown onyx, with bluifh white zones.

OOST, a kiln for drying hops after they are picked from the ftalks.

OOSTERGO, the north divifion of Weft Friefland, one of the United Provinces.

OPACITY, in philofophy, a quality of bodies which renders them impervious to the rays of light. See OPTICS.

OPAL, in natural hiftory, a fpecies of gems.

The opal is a gem of a peculiar kind, and has been efteemed by many in all ages of very great value; though at prefent it is of lefs value, in proportion to its fize, than any of the finer gems. It is fofter than any other of the fine gems, and is difficult to polifh to any degree of nicety. It is found of various fhapes and fizes: its moft frequent bignefs is between that of a pea and a horfe-bean; but it is found as fmall as the head of a large pin, and has been feen of the fize of a large walnut. Its figure is very various and uncertain, but it is never found in a cryftalliform or columnar ftate; its moft ufual fhape is an irregularly oblong one, convex above, flatted at bottom, and dented with various finuofities at its fides. It is often found among the loofe earth of mountains, fometimes on the fhores of rivers, and not unfrequently bedded in the coarfer kinds of jafper.

It is found in Egypt, Arabia, ſome parts of the Eaſt-Indies, and in many parts of Europe: thoſe of Europe are principally from Bohemia, and are of a greeniſh or greyiſh colour; the colour of other opals much reſembles the fineſt mother of pearl, its baſis ſeeming a bluiſh or greyiſh white, but with a property of reflecting all the colours of the rainbow, as turned differently to the light.

OPALIA, in antiquity, feaſts celebrated at Rome in honour of the goddeſs Ops. Varro ſays they were held on the nineteenth of December, which was one of the days of the Saturnalia: theſe two feaſts were celebrated in the ſame month, becauſe Saturn and Ops were huſband and wife: the vows offered to the goddeſs were made ſitting on the ground.

OPERA, a dramatic compoſition ſet to muſic, and ſung on the ſtage, accompanied with muſical inſtruments, and enriched with magnificent dreſſes, machines, and other decorations.

OPERATION, in general, the act of exerting or exerciſing ſome power or faculty, upon which an effect follows.

Operation, in chirurgery, denotes a methodical action of the hand on the human body, in order to reeſtabliſh health. See Surgery.

OPERATOR, a perſon who performs an operation.

OPHIDIUM, in ichthyology, a genus belonging to the order of apodes. The head is ſomewhat naked; the teeth are in the jaws, palate, and fauces; there are ſeven rays in the gill membrane; and the body is ſhaped like a ſword. There are two ſpecies, *viz.* the barbatum, with four cirri; and the imberbe, which has no cirri, and the tail is blunt.

OPHIOGLOSSUM, in botany, a genus of the cryptogamia filices claſs. The ſpike is jointed. There are ſeven ſpecies, only one of which, *viz.* the vulgatum, or adders-tongue, is a native of Britain.

OPHIOMANCY, in antiquity, the art of making predictions from ſerpents. Thus Calchas, on ſeeing a ſerpent devour eight ſparrows with their dam, foretold the duration of the ſiege of Troy. And the ſeven quoils of a ſerpent that was ſeen on Anchiſes's tomb, were interpreted to mean the ſeven years that Æneas wandered from place to place before he arrived in Latium.

OPHIORHIZA, in botany, a genus of the pentandria monogynia claſs. The calix is funnel-ſhaped; the germen is bifid; it has two ſtigmata; and the fruit has two lobes; there are two ſpecies, none of them natives of Britain.

OPHIOXYLON, in botany, a genus of the polygamia monoecia claſs. The corolla and calix of the hermaphrodite conſiſts of five ſegments; it has five ſtamina, and one piſtillum: The calix of the male is bifid; the corolla is funnel-ſhaped, with a cylindrical nectarium near the inner edge, and conſiſts of five ſegments; it has only two ſtamina. There is but one ſpecies, a native of Ceylon.

OPHITES, in natural hiſtory, a ſort of variegated marble, of a duſky-green ground, ſprinkled with ſpots of a lighter green, otherwiſe called ſerpentine.

Ophites, in church hiſtory, Chriſtian heretics, ſo called both from the veneration they had for the ſerpent that tempted Eve, and the worſhip they paid to a real ſerpent.

Ophrys, in botany, a genus of the gynandria diandria claſs. The nectarium has a kind of carina on the under part. There are 18 ſpecies, eleven of which are natives of Britain

OPHTHALMIA, in medicine, an inflammation of the membranes which inveſt the eye; eſpecially of the adnata, or albugineous coat. See Medicine.

Ophthalmic nerves. See Anatomy, p. 248.

OPHTHALMOSCOPY, a branch of phyſiognomy, which deduces the knowledge of a man's temper and manners from the appearance of his eyes.

OPIATES, medicines of a thicker conſiſtence than a ſyrup, prepared with opium ſcarcely fluid. They conſiſt of various ingredients, made up with honey or ſyrup; and are to be uſed for a long time either for purgative, alterative, or corroborative intentions.

The word opiate is alſo uſed, in general, for any medicine given with an intention to procure ſleep, whether in the form of electuaries, drops, or pills.

OPINION, is defined to be an aſſent of the mind to propoſitions not evidently true at firſt ſight.

OPISTHOTONOS, in medicine, a kind of convulſion, wherein the body is bent backwards.

OPIUM, in the materia medica, is an inſpiſſated juice, partly of the reſinous, and partly of the gummy kind, brought to us in cakes from eight ounces to a pound weight. It is very heavy, of a denſe texture, and not perfectly dry; but, in general, eaſily receives an impreſſion from the finger: its colour is a browniſh yellow, ſo very dark and duſky that at firſt it appears black: it has a dead and faint ſmell, and its taſte is very bitter and acrid. It is to be choſen moderately firm, and not too ſoft; its ſmell and taſte ſhould be very ſtrong, and care is to be taken that there is no dirty or ſtony matter in it.

Opium is the juice of the papaver album, or white poppy, with which the fields of Aſia Minor are in many places ſown, as ours are with corn. When the heads are near ripening, they wound them with an inſtrument that has five edges, which on being ſtuck into the head makes at once five long cuts in it; and from theſe wounds the opium flows, and is next day taken off by a perſon who goes round the field, and put up in a veſſel which he carries faſtened to his girdle; at the ſame time that this opium is collected, the oppoſite ſide of the poppy head is wounded, and the opium collected from it the next day. They diſtinguiſh, however, the produce of the firſt wounds from that of the ſucceeding ones; for the firſt juice afforded by the plant is greatly ſuperior to what is obtained afterwards. After they have collected the opium, they moiſten it with a ſmall quantity of water or honey, and work it a long time upon a flat, hard, and ſmooth board, with a thick and ſtrong inſtrument of the ſame wood, till it becomes of the conſiſtence of pitch; and then work it up with their hands, and form it into cakes or rolls for ſale.

Opium at present is in great esteem, and is one of the most valuable of all the simple medicines. Applied externally, it is emollient, relaxing, and discutient, and greatly promotes suppuration: if long kept, upon the skin, it takes off the hair, and always occasions an itching in it; sometimes it exulcerates it, and raises little blisters, if applied to a tender part: sometimes, on external application, it allays pain, and even occasions sleep: but it must by no means be applied to the head, especially to the sutures of the skull; for it has been known to have the most terrible effects in this application, and even to bring on death itself. Opium, taken internally removes melancholy, eases pain, and disposes to sleep; in many cases removes hæmorrhages, provokes sweating. A moderate dose is commonly under a grain; though, according to the circumstances, two grains, or even three, may be within the limits of this denomination: but custom will make people bear a dram or more; though in this case nature is vitiated, and nothing is to be hence judged in regard to others. If given dissolved, it operates in half an hour; if in a solid form, as in pills, or the like, it is sometimes an hour and a half. Its first effect, in this case, is the making the patient cheerful, as if he had drank moderately of wine, and at the same time bold and above the fear of danger; for which reason the Turks always take it when they are going to battle. A very immoderate dose brings on a sort of drunkenness, much like that occasioned by an immoderate quantity of strong liquors; cheerfulness and loud laughter at first, than a relaxation of the limbs, a loss of memory, and lightheadedness; then vertigoes, dimness of the eyes, with a laxity of the cornea and a dilatation of the pupils, a slowness of the pulse, redness of the face, relaxation of the under jaws, swelling of the lips, difficulty of breathing, painful erection of the penis, convulsions, cold sweats, and finally death. Those who escape are usually relieved by a great number of stools, or profuse sweats.

Prepared opium, commonly called extract of opium, is made by dissolving opium in a sufficient quantity of water with a gentle heat; then straining the solution from the fæces, and evaporating it to the consistence of honey. Tincture of opium, or liquid laudanum, otherwise called the thebaic tincture, is made as follows: Take of prepared opium, two ounces; of cinnamon and cloves, each one drachm; of white-wine, one pint; infuse them a week without heat, and then filtre it through paper.

OPOBALSAMUM, in the materia medica. See Balsam.

OPOPANAX, in the materia medica, is a gum resin of a tolerably firm texture, usually brought to us in loose granules or drops, and sometimes in large masses, formed of a number of these connected by a quantity of matter of the same kind; but these are usually loaded with extraneous matter, and are greatly inferior to the pure loose kind. The dropes or granules of the fine opopanax, are on the outside of a brownish red colour, and of a dusky yellowish or whitish colour within: they are of a somewhat unctuous appearance, smooth on the surface; and are to be chosen in clear pieces, of a strong smell and acrid taste.

Opopanax is attenuating and discutient, and is gently purgative; it dispels flatulencies, and is good in asthmas, in inveterate coughs, and in disorders of the hand and nerves. It also promotes the menses, and is good against all obstructions of the viscera.

OPOSSUM, in zoology. See Didelphis.

OPPILATION, in medicine, the act of obstructing or stopping up the passages of the body, by redundant or peccant humours. This word is chiefly used for obstructions in the lower belly.

OPPONENT, a person who withstands or opposes another.

OPPOSITION, in logic, the disagreement between propositions which have the same subject and the same predicate.

OPTATIVE mood, in grammar, that which serves to express an ardent desire or wish for something.

In most languages, except the Greek, the optative is only expressed by prefixing to the subjunctive an adverb of wishing; as *utinam*, in Latin; *plut a Dieu*, in French; and *would to God*, in English.

OPTERIA, in antiquity, presents made by a bridegroom to his bride, when first conducted to him.

O P T I C S.

THE cause and nature of vision are properly the subject of that part of natural philosophy which is called Optics: but as light is the cause of vision, the word Optics is commonly used in a more extensive sense; and every thing is looked upon as a part of Optics which relates to the nature and qualities of light. If we use the word Optics, in the stricter sense of it, for the theory of vision, the science of Optics is divided into two parts, *viz.* Dioptrics and Catoptrics. The laws of refraction, and the effects which the refraction of light has in vision, are the subject of Dioptrics: The laws of reflection, and the effects which the reflection of light has in vision, are the subject of Catoptrics. But this division of Optics is of no use; for there are many propositions in Optics where both parts are mixed, and many that cannot be properly reduced to either; and therefore we shall not make any use of that distinction in the following Treatise.

Of Light.

Light consists of an inconceivably great number of particles flowing from a luminous body in all manner of directions; and these particles are so small, as to surpass all human comprehension.

That the number of particles of light is inconceivably great

great, appears from the light of a candle; which, if there be no obstacle in the way to obstruct the passage of its rays, will fill all the space within two miles of the candle every way with luminous particles, before it has lost the least sensible part of its substance.

A ray of light is a continued stream of these particles, flowing from any visible body in a straight line: and that the particles themselves are incomprehensibly small, is manifest from the following experiment. Make a small pin-hole in a piece of black paper, and hold the paper upright on a table facing a row of candles standing by one another; then place a sheet of pasteboard at a little distance behind the paper, and some of the rays which flow from all the candles through the hole in the paper, will form as many specks of light on the pasteboard, as there are candles on the table before the plate: each speck being as distinct and clear, as if there was only one speck from one single candle: which shews, that the particles of light are exceedingly small, otherwise they could not pass through the hole from so many different candles without confusion.—Dr Niewentyt has computed, that there flows more than 6,000,000,000,000 times as many particles of light from a candle in one second of time, as there are grains of sand in the whole earth, supposing each cubic inch of it to contain 1,000,000.

These particles, by falling directly upon our eyes, excite in our minds the idea of light. And when they fall upon bodies, and are thereby reflected to our eyes, they excite in us the ideas of these bodies. And as every point of a visible body reflects the rays of light in all manner of directions, every point will be visible in every part to which the light is reflected from it. Thus the object *ABC* (Optical Plates, fig. n° 1.) is visible to an eye in any part where the rays *Aa*, *Ab*, *Ac*, *Ad*, *Ae*, *Ba*, *Bb*, *Bc*, *Bd*, *Be*, and *Ca*, *Cb*, *Cc*, *Cd*, *Ce*, come. Here we have shewn the rays as if they were only reflected from the ends *A* and *B*, and from the middle point *C* of the object; every other point being supposed to reflect rays in the same manner. So that, where-ever a spectator is placed with regard to the body, every point of that part of the surface which is towards him will be visible, when no intervening object stops the passage of the light.

Since no object can be seen through the bore of a bended pipe, it is evident that the rays of light move in straight lines, whilst there is nothing to refract or turn them out of their rectilineal course.

Whilst the rays of light continue in any * medium of an uniform density, they are straight; but when they pass obliquely out of one medium into another which is either more dense or more rare, they are refracted towards the denser medium: and this refraction is more or less, as the rays fall more or less obliquely on the refracting surface which divides the mediums.

To prove this by experiment, set the empty vessel *ABCD* (No. 2.) into any place where the sun shines obliquely, and observe the part where the shadow of the edge *BC* falls on the bottom of the vessel at *E*; then fill the vessel with water, and the shadow will reach no farther than *e*; which shews, that the ray *aBE*, which came straight in the open air, just over the edge of the vessel at *B* to its bottom at *E*, is refracted by falling obliquely on the surface of the water at *B*: and instead of going on in the rectilineal direction *aBE*, it is bent downward in the water from *B* to *e*, the whole bend being at the surface of the water: and so of all other rays *abc*.

If a stick be laid over the vessel, and the sun's rays be reflected from a glass perpendicularly into the vessel, the shadow of the stick will fall upon the same part of the bottom, whether the vessel be empty or full; which shews that the rays of light are not refracted when they fall perpendicularly on the surface of any medium.

The rays of light are as much refracted by passing out of water into air, as by passing out of air into water. Thus, if a ray of light flows from the point *e*, under water, in the direction *eB*; when it comes to the surface of the water at *B*, it will not go on thence in the rectilineal course *Bd*, but will be refracted into the line *Ba*. Therefore,

To an eye at *e* looking through a plane glass in the bottom of the empty vessel, the point *a* cannot be seen, because the side *Bc* of the vessel interposes; and the point *d* will just be seen over the edge of the vessel at *B*. But if the vessel be filled with water, the point *a* will be seen from *e*; and will appear as at *d*, elevated in the direction of the ray *eB*. Hence a piece of money lying at *e*, in the bottom of an empty vessel, cannot be seen by an eye at *a*, because the edge of the vessel intervenes; but let the vessel be filled with water, and the ray *ea* being then refracted at *B*, will strike the eye at *a*, and so render the money visible, which will appear as if it were raised up to *f* in the line *aBf*.

The time of sun-rising or setting, supposing its rays suffered no refraction, is easily found by calculation. But observation proves, that the sun rises sooner and sets later every day than the calculated time; the reason of which is plain, from what was said immediately above. For, though the sun's rays do not come part of the way to us through water, yet they do through the air or atmosphere, which being a grosser medium than the free space between the sun and the top of the atmosphere, the rays, by entering obliquely into the atmosphere, are there refracted, and thence bent down to the earth. And although there are many places of the earth to which the sun is vertical at noon, and consequently his rays can suffer no refraction at that time, because they come perpendicularly through the atmosphere; yet there is no place to which the sun's rays do not fall obliquely on the top of the atmosphere, at his rising and setting; and consequently, no clear day in which the sun will not be visible before he rises in the horizon, and after he sets in it; and the longer or shorter, as the atmosphere is more or less replete with vapours. For, let *ABC*, (No. 3.) be part of the earth's surface, *DEF* the atmosphere that covers it, and *EBGH* the sensible horizon of an observer at *B*. As every point of the sun's surface sends out rays of light in all manner of directions, some of his rays will constantly fall upon, and enlighten, some half of our atmosphere; and

* Any thing through which the rays of light can pass, is called a medium; as air, water, glass, diamond, or even a vacuum.

and therefore, when the ſun is at *I*, below the horizon *H*, thoſe rays which go on in the free ſpace *IkK* preſerve a rectilineal courſe until they fall upon the top of the atmoſphere; and thoſe which fall ſo about *K*, are refracted at their entrance into the atmoſphere, and bent down in the line *KmB*, to the obſerver's place at *B*: and therefore, to him the ſun will appear at *L*, in the direction of the ray *BmK*, above the horizon *BGH*, when he is really below it at *I*.

The angle contained between a ray of light, and a perpendicular to the refracting ſurface, is called *the angle of incidence;* and the angle contained between the ſame perpendicular, and the ſame ray after refraction, is called *the angle of refraction*. Thus (No. 4.) let *LBM* be the refracting ſurface of a medium (ſuppoſe water,) and *ABC* a perpendicular to that ſurface; let *DB* be a ray of light, going out of air into water at *B*, and therein refracted in the line *BH;* the angle *ABD*, is the angle of incidence, of which *DF* is the ſine; and the angle *KBH* is the angle of refraction, whoſe ſine is *KI*.

When the refracting medium is water, the ſine of the angle of incidence is to the ſine of the angle of refraction as 4 to 3; which is confirmed by the following experiment, taken from Doctor Smith's Optics.

Deſcribe the circle *DAEC* on a plane ſquare board, and croſs it at right angles with the ſtraight lines *ABC*, and *LBM*; then, from the interſection *A*, with any opening of the compaſſes, ſet off the equal arcs *AD* and *AE*, and draw the right line *DFE*: then, taking *Fa*, which is three quarters of the length *FE*, from the point *a*, draw *aI* parallel to *ABK*, and join *KI* parallel to *BM*: ſo *KI* will be equal to three quarters of *FE* or of *DF*. This done, fix the board upright upon the leaden pedeſtal *O*, and ſtick three pins perpendicularly into the board, at the points *D*, *B*, and *I*: then ſet the board upright into the veſſel *TUV*, and fill up the veſſel with water to the line *LBM*. When the water has ſettled, look along the line *DB*, ſo as you may ſee the head of the pin *B* over the head of the pin *D*; and the pin *I* will appear in the ſame right line produced to G, for its head will be ſeen juſt over the head of the pin at *B*: which ſhews that the ray *IB*, coming from the pin at *I*, is ſo refracted at *B*, as to proceed from thence in the line *BD* to the eye of the obſerver; the ſame as it would do from any point *G* in the right line *DBG*, if there were no water in the veſſel: and alſo ſhews, that *KI*, the ſine of refraction in water, is to *DF*, the ſine of incidence in air, as 3 to 4.

Hence, if *DBH* were a crooked ſtick put obliquely into the water, it would appear a ſtraight one at *DBG*. Therefore, as the line *BH* appears at *BG*, ſo the line *BG* will appear at *Bg;* and conſequently, a ſtraight ſtick *DBG* put obliquely into water, will ſeem bent at the ſurface of the water in *B*, and crooked, as *DBg*.

When a ray of light paſſes out of air into glaſs, the ſine of incidence is to the ſine of refraction as 3 to 2; and when out of air into a diamond, as 5 to 2.

Of Glasses.

Glass may be ground into eight different ſhapes at leaſt, for optical purpoſes, *viz.*

1. A *plane glaſs*, (No. 5.) which is flat on both ſides, and of equal thickneſs in all parts, as *A*.
2. A *plano-convex*, which is flat on one ſide, and convex on the other, as *B*.
3. A *double-convex*, which is convex on both ſides, as *C*.
4. A *plano-concave*, which is flat on one ſide, and concave on the other, as *D*.
5. A *double concave*, which is concave on both ſides, as *E*.
6. A *meniſcus*, which is concave on one ſide, and convex on the other, as *F*.
7. A *flat plano-convex*, whoſe convex ſide is ground into ſeveral little flat ſurfaces, as *G*.
8. A *priſm*, which has three flat ſides; and when viewed endwiſe, appears like an equilateral triangle, as *H*.

Glaſſes ground into any of the ſhapes *B*, *C*, *D*, *E*, *F*, are generally called *lenſes*.

A right line *LIK*, (No. 6.) going perpendicularly through the middle of a lens, is called *the axis of the lens*.

A ray of light *Gh*, falling perpendicularly on a plane glaſs *EF*, will paſs through the glaſs in the ſame direction *hi*, and go out of it into the air in the ſame right courſe *iH*.

A ray of light *AB*, falling obliquely on a plane glaſs, will go out of the glaſs in the ſame direction, but not in the ſame right line: for in touching the glaſs, it will be refracted in the line *BC*; and in leaving the glaſs, it will be refracted in the line *CD*.

A ray of light *CD*, (No. 7.) falling obliquely on the middle of a convex glaſs, will go forward in the ſame direction *DE*, as if it had fallen with the ſame degree of obliquity on a plane glaſs; and will go out of the glaſs in the ſame direction with which it entered: for it will be equally refracted at the points *D* and *E*, as if it had paſſed through a plane ſurface. But the rays *CG* and *CI* will be ſo refracted, as to meet again at the point *F*. Therefore, all the rays which flow from the point *C*, ſo as to go through the glaſs, will meet again at *F*; and if they go farther onward, as to *L*, they croſs at *F*, and go forward on the oppoſite ſides of the middle ray *CDEF*, to what they were in approaching it in the directions *HF* and *KF*.

When parallel rays, as *ABC*, (No. 8.) fall directly upon a plano-convex glaſs *DE*, and paſs through it, they will be ſo refracted, as to unite in a point *f* behind it; and this point is called the *principal focus;* the diſtance of which, from the middle of the glaſs, is called the *focal diſtance*, which is equal to twice the radius of the ſphere of the glaſs's convexity. And,

When parallel rays, as *ABC*, (No. 9.) fall directly upon a glaſs *DE*, which is equally convex on both ſides, and paſs through it; they will be ſo refracted, as to meet in a point or principal focus *f*, whoſe diſtance is equal to the radius or ſemidiameter of the ſphere of the glaſs's convexity. But if a glaſs be more convex on one ſide than on the other, the rule for finding the focal diſtance is this: As the ſum of the ſemidiameters of both convexities is to the ſemidiameter of either, ſo is double the

femidiameter of the other to the diſtance of the focus. Or, divide the double product of the radii by their ſum, and the quotient will be the diſtance ſought.

Since all thoſe rays of the ſun which paſs through a convex glaſs are collected together in its focus, the force of all their heat is collected into that part; and is in proportion to the common heat of the ſun, as the area of the glaſs to the area of the focus. Hence we ſee the reaſon why a convex glaſs cauſes the ſun's rays to burn after paſſing through it.

All theſe rays croſs the middle ray in the focus *f*, and then diverge from it, to the contrary ſides, in the ſame manner *FfG*, as they converged in the ſpace *DfE* in coming to it.

If another glaſs *FG*, of the ſame convexity as *DE*, be placed in the rays at the ſame diſtance from the focus, it will refract them ſo, as that, after going out of it, they will be all parallel, as *abc*; and go on in the ſame manner as they came to the firſt glaſs *DE*, through the ſpace *ABC*; but on the contrary ſides of the middle ray *Bfb*: for the ray *ADf* will go on from *f* in the direction *fGa*, and the ray *CEf* in the direction *fFc*; and ſo of the reſt.

The rays diverge from any radiant point, as from a principal focus: therefore if a candle be placed at *f*, in the focus of the convex glaſs *FG*, the diverging rays in the ſpace *EfG* will be ſo refracted by the glaſs, as that, after going out of it, they will become parallel, as ſhewn in the ſpace *cba*.

If the candle be placed nearer the glaſs than its focal diſtance, the rays will converge after paſſing through the glaſs more or leſs as the candle is more or leſs diſtant from the focus.

If the candle be placed farther from the glaſs than its focal diſtance, the rays will converge after paſſing thro' the glaſs, and meet in a point, which will be more or leſs diſtant from the glaſs as the candle is nearer to or farther from its focus: and where the rays meet, they will form an inverted image of the flame of the candle; which may be ſeen on a paper placed in the meeting of the rays.

Hence, if any object *ABC* (No. 10.) be placed beyond the focus *F* of the convex glaſs *def*, ſome of the rays which flow from every point of the object, on the ſide next the glaſs, will fall upon it; and after paſſing through it, they will be converged into as many points on the oppoſite ſide of the glaſs, where the image of every point will be formed, and conſequently the image of the whole object, which will be inverted. Thus, the rays *Ad*, *Ae*, *Af*, flowing from the point *A*, will converge in the ſpace *daf*, and by meeting at *a* will there form the image of the point *A*. The rays *Bb*, *Be*, *Bf*, flowing from the point *B*, will be united at *b* by the refraction of the glaſs, and will there form the image of the point *B*. And the rays *Cd*, *Ce*, *Cf*, flowing from the point *C*, will be united at *c*, where they will form the image of the point *C*. And ſo of all the other intermediate points between *A* and *C*. The rays which flow from every particular point of the object, and are united again by the glaſs, are called *pencils of rays*.

If the object *ABC* be brought nearer to the glaſs, the picture *abc* will be removed to a greater diſtance. For then more rays flowing from every ſingle point, will all more diverging upon the glaſs; and therefore cannot be ſo ſoon collected into the correſponding points behind it. Conſequently, if the diſtance of the object *ABC* (No 11.) be equal to the diſtance *eB* of the focus of the glaſs, the rays of each pencil will be ſo refracted by paſſing through the glaſs, that they will go out of it parallel to each other; as *dI*, *eH*, *fh*, from the point *C*; *dG*, *eK*, *fD*, from the point *B*; and *dK*, *eE*, *fL*, from the point *A*: and therefore, there will be no picture formed behind the glaſs.

If the focal diſtance of the glaſs, and the diſtance of the object from the glaſs, be known, the diſtance of the picture from the glaſs may be found by this rule, *viz.* Multiply the diſtance of the focus by the diſtance of the object, and divide the product by the difference; the quotient will be the diſtance of the picture.

The picture will be as much bigger or leſs than the object, as its diſtance from the glaſs is greater or leſs than the diſtance of the object. For, as *Be* (No. 10.) is to *eB*, ſo is *AC* to *ca*. So that if *ABC* be the object, *cba* will be the picture; or if *cba* be the object, *ABC* will be the picture.

Having deſcribed how the rays of light, flowing from objects and paſſing through convex glaſſes, are collected into points, and form the images of the objects; it will be eaſy to underſtand how the rays are affected by paſſing through the humours of the eye, and are thereby collected into innumerable points on the bottom of the eye, and thereon form the images of the objects which they flow from. For, the different humours of the eye, and particularly the chryſtalline humour, are to be conſidered as a convex glaſs; and the rays in paſſing through them to be affected in the ſame manner as in paſſing through a convex glaſs.—For a deſcription of the coats and tumours of the eye, ſee ANATOMY, p. 289.

As every point of an object *ABC*, (No. 12.) ſends out rays in all directions, ſome rays, from every point on the ſide next the eye, will fall upon the cornea between *E* and *F*; and by paſſing on through the humours and pupil of the eye, they will be converged to as many points on the retina or bottom of the eye, and will thereon form a diſtinct inverted picture *cba* of the object. Thus, the pencil of rays *qrs* that flows from the point *A* of the object, will be converged to the point *a* on the retina; thoſe from the point *B* will be converged to the point *b*; thoſe from the point *C* will be converged to the point *c*; and ſo of all the intermediate points; by which means the whole image *abc* is formed, and the object made viſible: although it muſt be owned, that the method by which this ſenſation is carried from the eye by the optic nerve to the common ſenſory in the brain, and there diſcerned, is above the reach of our comprehenſion.

But that viſion is effected in this manner, may be demonſtrated experimentally. Take a bullock's eye whilſt it is freſh, and having cut off the three coats from the back part, quite to the vitreous humour, put a piece of white paper over that part, and hold the eye towards any bright object, and you will ſee an inverted picture of the object upon the paper.

Since the image is inverted, many have wondered why the object appears upright. But we are to conſider, 1. That *inverted* is only a relative term; and, 2. That there

there is a very great difference between the real object and the means or image by which we perceive it. When all the parts of a distant prospect are painted upon the retina, they are all right with respect to one another, as well as the parts of the prospect itself; and we can only judge of an object's being inverted, when it is turned reverse to its natural position with respect to other objects which we see and compare it with.—If we lay hold of an upright stick in the dark, we can tell which is the upper or lower part of it, by moving our hand downward or upward; and know very well that we cannot feel the upper end by moving our hand downward. Just so we find by experience, that upon directing our eyes towards a tall object, we cannot see its top by turning our eyes downward, nor its foot by turning our eyes upward; but must trace the object the same way by the eye to see it from head to foot, as we do by the hand to feel it; and as the judgment is informed by the motion of the hand in one case, so it is also by the motion of the eye in the other.

In (No. 13.) is exhibited the manner of seeing the same object *ABC*, by both the eyes *D* and *E* at once.

When any part of the image *cba* falls upon the optic nerve *L*, the corresponding part of the object becomes invisible. On which account, nature has wisely placed the optic nerve of each eye, not in the middle of the bottom of the eye, but towards the side next the nose; so that whatever part of the image falls upon the optic nerve of one eye, may not fall upon the optic nerve of the other. Thus the point *a* of the image *cba* falls upon the optic nerve of the eye *D*, but not of the eye *E*; and the point *c* falls upon the optic nerve of the eye *E*, but not of the eye *D*: and therefore, to both eyes taken together, the whole object *ABC* is visible.

The nearer that any object is to the eye, the larger is the angle under which it is seen, and the magnitude under which it appears. Thus to the eye *D*, (No. 14.) the object *ABC* is seen under the angle *APC*; and its image *cba* is very large upon the retina: but to the eye *E*, at a double distance, the same object is seen under the angle *ApC*, which is equal only to half the angle *APC*, as is evident by the figure. The image *cba* is likewise twice as large in the eye *D*, as the other image *cba* is in the eye *E*. In both these representations, a part of the image falls on the optic nerve, and the object in the corresponding part is invisible.

As the sense of seeing is allowed to be occasioned by the impulse of the rays from the visible object upon the retina of the eye, and forming the image of the object thereon, and that the retina is only the expansion of the optic nerve all over the choroides; it should seem surprising, that the part of the image which falls on the optic nerve should render the like part of the object invisible; especially as that nerve is allowed to be the instrument by which the impulse and image are conveyed to the common sensory in the brain. But this difficulty vanishes, when we consider that there is an artery within the trunk of the optic nerve, which entirely obscures the image in that part, and conveys no sensation to the brain.

That the part of the image which falls upon the middle of the optic nerve is lost, and consequently the corresponding part of the object is rendered invisible, is plain by experiment. For, if a person fixes three patches, *A*, *B*, *C*, (No. 15.) upon a white wall, at the height of the eye, and the distance of about a foot from each other, and places himself before them, shutting the right eye, and directing the left towards the patch *C*, he will see the patches *A* and *C*, but the middle patch *B* will disappear. Or, if he shuts his left eye, and directs the right towards *A*, he will see both *A* and *C*, but *B* will disappear; and if he directs his eye towards *B*, he will see both *B* and *A*, but not *C*. For whatever patch is directly opposite to the optic nerve N, vanishes. This requires a little practice, after which he will find it easy to direct his eye, so as to lose the sight of whichever patch he pleases.

We are not commonly sensible of this disappearance, because the motions of the eye are so quick and instantaneous, that we no sooner lose the sight of any part of an object, than we recover it again; much the same as in the twinkling of our eyes; for at each twinkling we are blinded; but it is so soon over, that we are scarce ever sensible of it.

Some eyes require the assistance of convex glasses to make them see objects distinctly, and others of concave. If either the cornea *abc*, (No. 16.) or chrystalline humour *e*, or both of them, be too flat, as in the eye *A*, their focus will not be on the retina, as at *d*, where it ought to be, in order to render vision distinct; but beyond the eye, as at *f*. And therefore, those rays which flow from the object *C*, and pass through the humours of the eye, are not converged enough to unite at *d*; and therefore the observer can have but a very indistinct view of the object. This is remedied by placing a convex glass *gh* before the eye, which makes the rays converge sooner, and imprints the image duly on the retina at *d*.

If either the cornea, or chrystalline humour, or both of them, be too convex, as in the eye *B*, the rays that enter it from the object *C*, will be converged to a focus in the vitreous humour, as at *f*, and by diverging from thence to the retina, will form a very confused image thereon: and so, of course, the observer will have as confused a view of the object, as if his eye had been too flat. This inconvenience is remedied by placing a concave glass *gh* before the eye; which glass, by causing the rays to diverge between it and the eye, lengthens the focal distance so; that if the glass be properly chosen, the rays will unite at the retina, and form a distinct picture of the object upon it.

Such eyes as have their humours of a due convexity, cannot see any object distinctly at a less distance than six inches; and there are numberless objects too small to be seen at that distance, because they cannot appear under any sensible angle. The method of viewing such minute objects is by a *microscope*; of which there are three sorts, *viz.* the *single*, the *double*, and the *solar*.

Of Microscopes.

The *single microscope* is only a small convex glass, as *cd*, (No. 17.) having the object *ab* placed in its focus, and the eye at the same distance on the other side; so that the rays of each pencil, flowing from every point of the object on the side next the glass, may go on parallel

rallel to the eye after passing through the glass; and then, by entering the eye at *C*, they will be converged to as many different points on the retina, and form a large inverted picture *AB* upon it, as in the figure.

To find how much this glass magnifies, divide the least distance (which is about six inches) at which an object can be seen distinctly with the bare eye, by the focal distance of the glass; and the quotient will shew how much the glass magnifies the diameter of the object.

The *double* or *compound microscope*, (No. 18.) consists of an object-glass *cd*, and an eye-glass *ef*. The small object *ab* is placed at a little greater distance from the glass *cd* than its principal focus, so that the pencils of rays flowing from the different points of the object, and passing through the glass, may be made to converge and unite in as many points between *g* and *h*, where the image of the object will be formed: which image is viewed by the eye through the eye-glass *ef*. For the eye-glass being so placed, that the image *gh* may be in its focus, and the eye much about the same distance on the other side, the rays of each pencil will be parallel, after going out of the eye-glass, as at *e* and *f*, till they come to the eye at *k*, where they will begin to converge by the refractive power of the humours; and after having crossed each other in the pupil, and passed through the chrystalline and vitreous humours, they will be collected into points on the retina, and form the large inverted image *AB* thereon.

The magnifying power of this microscope is as follows. Suppose the image *gh* to be six times the distance of the object *ab* from the object-glass *cd*; then will the image be six times the length of the object: but since the image could not be seen distinctly by the bare eye at a less distance than six inches, if it be viewed by an eye-glass *ef*, of one inch focus, it will thereby be brought six times nearer the eye; and consequently viewed under an angle six times as large as before; so that it will be again magnified six times; that is, six times by the object-glass, and six times by the eye-glass; which multiplied into one another, makes 36 times; and so much is the object magnified in diameter more than what it appears to the bare eye; and consequently 36 times 36, or 1296 times, in surface.

But, because the extent or field of view is very small in this microscope, there are generally two eye-glasses placed sometimes close together, and sometimes an inch asunder; by which means, although the object appears less magnified, yet the visible area is much enlarged by the interposition of a second eye-glass, and consequently a much pleasanter view is obtained.

The *solar microscope*, (No. 19.) invented by Dr Lieberkhun, is constructed in the following manner. Having procured a very dark room, let a round hole be made in the window-shutter, about three inches diameter, through which the sun may cast a cylinder of rays *AA* into the room. In this hole, place the end of a tube, containing two convex glasses and an object, *viz.* 1. A convex glass *aa*, of about two inches diameter, and three inches focal distance, is to be placed in that end of the tube which is put into the hole. 2. The object *bb*, being put between two glasses (which must be concave to hold it at liberty) is placed about two inches and a half from the glass *aa*. 3. A little more than a quarter of an inch from the object is placed the small convex glass *cc*, whose focal distance is a quarter of an inch.

The tube may be so placed, when the sun is low, that his rays *AA* may enter directly into it: but when he is high, his rays *BB* must be reflected into the tube by the plane mirrour or looking glass *CC*.

Things being thus prepared, the rays that enter the tube will be conveyed by the glass *aa* towards the object *bb*, by which means it will be strongly illuminated; and the rays *d* which flow from it through the convex glass *cc*, will make a large inverted picture of the object at *DD*, which, being received on a white paper, will represent the object magnified in length, in proportion of the distance of the picture from the glass *cc*, to the distance of the object from the same glass. Thus, suppose the distance of the object from the glass to be $\frac{3}{10}$ parts of an inch, and the distance of the distinct picture to be 12 feet or 144 inches, in which there are 1440 tenths of an inch; and this number divided by 3 tenths, gives 480; which is the number of times the picture is longer or broader than the object; and the length multiplied by the breadth, shews how much the whole surface is magnified.

Of Telescopes.

Before we enter upon the description of telescopes, it will be proper to shew how the rays of light are affected by passing through concave glasses, and also by falling upon concave mirrours.

When parallel rays, as *abcdefgh*, (No. 20.) pass directly through a glass *AB*, which is equally concave on both sides, they will diverge after passing through the glass, as if they had come from a radiant point *C*, in the centre of the glass's concavity; which point is called the negative or virtual focus of the glass. Thus the ray *a*, after passing through the glass *AB*, will go on in the direction *kl*, as if it had proceeded from the point *C*, and no glass been in the way. The ray *b* will go on in the direction *mn*; the ray *c* in the direction *op*, &c.—The ray *C*, that falls directly upon the middle of the glass, suffers no refraction in passing through it; but goes on in the same rectilineal direction, as if no glass had been in its way.

If the glass had been concave only on one side, and the other side quite plane, the rays would have diverged, after passing through it, as if they had come from a radiant point at double the distance of *C* from the glass; that is, as if the radiant had been at the distance of a whole diameter of the glass's concavity.

If rays come more converging to such a glass, than parallel rays diverge after passing through it, they will continue to converge after passing through it; but will not meet so soon as if no glass had been in the way, and will incline towards the same side to which they would have diverged if they had come parallel to the glass. Thus the rays *f* and *h*, going in a converging state towards the edge of the glass at *B*, and converging more in their way to it than the parallel rays diverge after passing through it, they will go on converging after they pass through it, though

though in a less degree than they did before, and will meet at l: but if no glass has been in their way, they would have met at i.

When parallel rays, (No. 21.) as *dfa*, *Cmb*, *elc*, fall upon a concave mirrour *AB* (which is not transparent, but has only the surface *AbB* of a clear polish,) they will be reflected back from that mirrour, and meet in a point *m*, at half the distance of the surface of the mirrour from *C* the centre of its concavity; for they will be reflected at as great an angle from a perpendicular to the surface of the mirrour, as they fell upon it with regard to that perpendicular, but on the other side thereof. Thus, let *C* be the centre of concavity of the mirrour *AbB*; and let the parallel rays *dfa*, *Cmb*, and *elc*, fall upon it at the points *a*, *b*, and *c*. Draw the lines *Cia*, *Cmb*, and *Chc*, from the centre *C* to these points; and all these lines will be perpendicular to the surface of the mirrour, because they proceed thereto like so many radii or spokes from its centre. Make the angle *Cah* equal to the angle *daC*, and draw the line *amh*, which will be the direction of the ray *dfa*, after it is reflected from the point *a* of the mirrour; so that the angle of incidence *daC*, is equal to the angle of reflection *Cah*; the rays making equal angles with the perpendicular *Cia* on its opposite sides.

Draw also the perpendicular *Chc* to the point *c*, where the ray *elc* touches the mirrour; and, having made the angle *Cci* equal to the angle *Cce*, draw the line *cmi*, which will be the course of the ray *elc*, after it is reflected from the mirrour.

The ray *Cmb* passing through the centre of concavity of the mirrour, and falling upon it at *b*, is perpendicular to it; and is therefore reflected back from it in the same line *bmC*.

All these reflected rays meet in the point *m*; and in that point the image of the body which emits the parallel rays *da*, *Cb*, and *ec*, will be formed; which point is distant from the mirrour equal to half the radius *bmC* of its concavity.

The rays which proceed from any celestial object may be esteemed parallel at the earth; and therefore, the images of that object will be formed at *m*, when the reflecting surface of the concave mirrour is turned directly towards the object. Hence, the focus *m* of parallel rays is not in the centre of the mirrour's concavity, but half way between the mirrour and that centre.

The rays which proceed from any remote terrestrial object, are nearly parallel at the mirrour; not strictly so, but come diverging to it, in separate pencils, or, as it were, bundles of rays, from each point of the side of the object next the mirrour; and therefore they will not be converged to a point at the distance of half the radius of the mirrour's concavity from its reflecting surface, but into separate points at a little greater distance from the mirrour. And the nearer the object is to the mirrour, the farther these points will be from it; and an inverted image of the object will be formed in them, which will seem to hang pendant in the air; and will be seen by an eye placed beyond it (with regard to the mirrour) in all respects like the object, and as distinct as the object itself.

Let *AcB*, (No. 22.) be the reflecting surface of a mirrour, whose centre of concavity is at *C*; and let the upright object *DE* be placed beyond the centre *C*, and send out a conical pencil of diverging rays from its upper extremity *D*, to every point of the concave surface of the mirrour *AcB*. But to avoid confusion, we only draw three rays of that pencil, as *DA*, *Dc*, *DB*.

From the centre of concavity *C*, draw the three right lines *CA*, *Cc*, *CB*, touching the mirrour in the same points where the foresaid rays touch it; and all these lines will be perpendicular to the surface of the mirrour. Make the angle *CAd* equal to the angle *DAC*, and draw the right line *Ad* for the course of the reflected ray *DA*: make the angle *Ccd* equal to the angle *DcC*, and draw the right line *cd* for the course of the reflected ray *Dd*: make also the angle *CBd* equal to the angle *DBC*, and draw the right line *Bb* for the course of the reflected ray *DB*. All these reflected rays will meet in the point *d*, where they will form the extremity *d* of the inverted image *ed*, similar to the extremity *D* of the upright object *DE*.

If the pencil of rays *Eg*, *Eh*, be also continued to the mirrour, and their angles of reflection from it be made equal to their angles of incidence upon it, as in the former pencil from *D*, they will all meet at the point *e* by reflection, and form the extremity *e* of the image *ed*, similar to the extremity *E* of the object *DE*.

And as each intermediate point of the object, between *D* and *E*, sends out a pencil of rays in like manner to every part of the mirrour, the rays of each pencil will be reflected back from it, and meet in all the intermediate points between the extremities *e* and *d* of the image; and so the whole image will be formed, not at *i*, half the distance of the mirrour from its centre of concavity *C*; but at a greater distance, between *i* and the object *DE*; and the image will be inverted with respect to the object.

This being well understood, the reader will easily see how the image is formed by the large concave mirrour of the reflecting telescope, when he comes to the description of that instrument.

When the object is more remote from the mirrour than its centre of concavity *C*, the image will be less than the object, and between the object and mirrour: when the object is nearer than the centre of concavity, the image will be more remote and bigger than the object: thus, if *DE* be the object, *ed* will be its image: for, as the object recedes from the mirrour, the image approaches nearer to it; and as the object approaches nearer to the mirrour, the image recedes farther from it; on account of the lesser or greater divergency of the pencils of rays which proceed from the object: for, the less they diverge, the sooner they are converged to points by reflection; and the more they diverge, the farther they must be reflected before they meet.

If the radius of the mirrour's concavity, and the distance of the object from it, be known, the distance of the image from the mirrour is found by this rule; Divide the product of the distance and radius by double the distance made less by the radius, and the quotient is the distance required.

If the object be in the centre of the mirrour's concavity,

cavity, the image and object will be coincident, and equal in bulk.

If a man places himſelf directly before a large concave mirrour, but farther from it than its centre of concavity, he will ſee an inverted image of himſelf in the air, between him and the mirrour, of a leſs ſize than himſelf. And if he holds out his hand towards the mirrour, the hand of the image will come out towards his hand, and coincide with it, of an equal bulk, when his hand is in the centre of concavity; and he will imagine he may ſhake hands with his image. If he reaches his hand farther, the hand of the image will paſs by his hand, and come between his hand and his body: and if he moves his hand towards either ſide, the hand of the image will move towards the other; ſo that whatever way the object moves, the image will move the contrary.

All the while a by-ſtander will ſee nothing of the image, becauſe none of the reflected rays that form it enter his eyes.

If a fire be made in a large room, and a ſmooth mahogony table be placed at a good diſtance near the wall, before a large concave mirrour, ſo placed, that the light of the fire may be reflected from the mirrour to its focus upon the table; if a perſon ſtands by the table, he will ſee nothing upon it but a longiſh beam of light: but if he ſtands at a diſtance towards the fire, not directly between the fire and mirrour, he will ſee an image of the fire upon the table, large and erect. And if another perſon, who knows nothing of this matter before-hand, ſhould chance to come into the room, and ſhould look from the fire towards the table, he would be ſtartled at the appearance; for the table would ſeem to be on fire, and, by being near the wainſcot, to endanger the whole houſe. In this experiment, there ſhould be no light in the room but what proceeds from the fire; and the mirrour ought to be at leaſt fifteen inches in diameter.

If the fire be darkened by a ſcreen, and a large candle be placed at the back of the ſcreen; a perſon ſtanding by the candle will ſee the appearance of a fine large ſtar, or rather planet, upon the table, as bright as Venus or Jupiter. And if a ſmall wax taper (whoſe flame is much leſs than the flame of the candle) be placed near the candle, a ſatellite to the planet will appear on the table: and if the taper be moved round the candle, the ſatellite will go round the planet.

In a *refracting teleſcope*, the glaſs which is neareſt the object in viewing it is called the *object-glaſs*, and that which is neareſt the eye is called *the eye-glaſs*. The object-glaſs muſt be convex, but the eye-glaſs may be either convex or concave: and generally, in looking through a teleſcope, the eye is in the focus of the eye-glaſs; though that is not very material: for the diſtance of the eye, as to diſtinct viſion, is indifferent, provided the rays of the pencils fall upon it parallel: only, the nearer the eye is to the end of the teleſcope, the larger is the ſcope or area of the field of view,

Let *cd* (No. 23.) be a convex glaſs fixed in a long tube, and have its focus at *E*. Then, a pencil of rays *ghi*, flowing from the upper extremity *A* of the remote object *AB*, will be ſo refracted by paſſing through the glaſs, as to converge and meet in the point *f*; whilſt the pencil of rays *klm*, flowing from the lower extremity *B* of the ſame object *AB*, and paſſing through the glaſs, will converge and meet in the point *e*: and the images of the points *A* and *B* will be formed in the points *f* and *e*. And as all the intermediate points of the object, between *A* and *B*, ſend out pencils of rays in the ſame manner, a ſufficient number of theſe pencils will paſs through the object-glaſs *cd*, and converge to as many intermediate points between *e* and *f*; and ſo will form the whole inverted image *eEf* of the diſtinct object. But becauſe this image is ſmall, a concave glaſs *no* is ſo placed in the end of the tube next the eye, that its virtual focus may be at *F*. And as the pencils of rays paſs converging through the concave glaſs, but converge leſs after paſſing through it than before, they go on further, as to *b* and *a*, before they meet; and the pencils themſelves being made to diverge by paſſing through the cuncave glaſs, they enter the eye, and form the large picture *ab* upon the retina, whereon it is magnified under the angle *bFa*.

But this teleſcope has one inconveniency which renders it unfit for moſt purpoſes, which is, that the pencils of rays being made to diverge by paſſing through the concave glaſs *no*, very few of them can enter the pupil of the eye; and therefore the field of view is but very ſmall, as is evident by the figure. For none of the pencils which flow either from the top or bottom of the object *AB* can enter the pupil of the eye at *C*, but are all ſtopt by falling upon the iris above and below the pupil: and therefore, only the middle part of the object can be ſeen when the teleſcope lies directly towards it, by means of thoſe rays which proceed from the middle of the object. So that to ſee the whole of it, the teleſcope muſt be moved upwards and downwards, unleſs the object be very remote; and then it is never ſeen diſtinctly.

This inconvenience is remedied by ſubſtituting a convex eye-glaſs, as *gh*, (No. 24.) in place of the concave one; and fixing it ſo in the tube, that its focus may be coincident with the focus of the object-glaſs *cd*, as at *E*. For then, the rays of the pencils flowing from the object *AB*, and paſſing through the object-glaſs *cd*, will meet in its focus, and form the inverted image *mEp*: and as the image is formed in the focus of the eye-glaſs *gh*, the rays of each pencil will be parallel, after paſſing through that glaſs; but the pencils themſelves will croſs in its focus on the other ſide, as at *e*: and the pupil of the eye being in this focus, the image will be viewed through the glaſs, under the angle *geh*; and being at *E*, it will appear magnified, ſo as to fill the whole ſpace *CmepD*.

But, as this teleſcope inverts the image with reſpect to the object, it gives an unpleaſant view of terreſtrial objects; and is only fit for viewing the heavenly bodies, in which we regard not their poſition, becauſe their being inverted does not appear on account of their being round. But whatever way the object ſeems to move, this teleſcope muſt be moved the contrary way, in order to keep ſight of it; for, ſince the object is inverted, its motion will be ſo too.

The magnifying power of this teleſcope is as the focal diſtance of the object-glaſs to the focal diſtance of the eye-glaſs. Therefore, if the former be divided by the latter, the quotient will expreſs the magnifying power.

When we ſpeak of the magnifying of a teleſcope or micro-

fcope, it is only meant with regard to the diameter, not to the area nor folidity of the object. But as the inftrument magnifies the vertical diameter, as much as it does the horizontal, it is eafy to find how much the whole visible area or furface is magnified: for, if the diameters be multiplied into one another, the product will exprefs the magnification of the whole vifible area. Thus, fuppofe the focal diftance of the object-glafs be ten times as great as the focal diftance of the eye-glafs; then, the object will be magnified ten times, both in length and breadth: and 10 multiplied by 10, produces 100; which fhews, that the area of the object will appear 100 times as big when feen through fuch a telefcope, as it does to the bare eye.

Hence it appears, that if the focal diftance of the eye-glafs were equal to the focal diftance of the object-glafs, the magnifying power of the telefcope would be nothing.

This telefcope may be made to magnify in any given degree, provided it be of a fufficient length. For, the greater the focal diftance of the object-glafs, the lefs may be the focal diftance of the eye-glafs; though not directly in proportion. Thus, an object-glafs, of 10 feet focal diftance, will admit of an eye-glafs whofe focal diftance is little more than $2\frac{1}{2}$ inches; which will magnify near 48 times: but an object-glafs, of 100 feet focus, will require an eye-glafs fomewhat more than 6 inches; and will therefore magnify almoft 200 times.

A telefcope for viewing terreftrial objects, fhould be fo conftructed, as to fhew them in their natural pofture. And this is done by one object-glafs *cd*, (No. 25.) and three eye-glaffes *ef*, *gh*, *ik*, fo placed, that the diftance between any two, which are neareft to each other, may be equal to the fum of their focal diftances; as in the figure, where the focus of the glaffes *cd* and *ef* meet at *F*, thofe of the glaffes *ef* and *gh* meet at *l*, and of *gh* and *ik* at *m*; the eye being at *n*, in or near the focus of the eye-glafs *ik*, on the other fide. Then, it is plain, that thefe pencils of rays, which flow from the object *AB*, and pafs through the object-glafs *cd*, will meet and form an inverted image *CFD* in the focus of that glafs; and the image being alfo in the focus of the glafs *ef*, the rays of the pencils will become parallel, after paffing through that glafs, and crofs at *l*, in the focus of the glafs *ef*; from whence they pafs on to the next glafs *gh*, and by going through it they are converged to points in its other focus, where they form an erect image *EmF* of the object *AB*: and as this image is alfo in the focus of the eye-glafs *ik*, and the eye on the oppofite fide of the fame glafs; the image is viewed through the eye-glafs in this telefcope, in the fame manner as through the eye-glafs in the former one; only in a contrary pofition, that is, in the fame pofition with the object.

The three glaffes next the eye have all their focal diftances equal: and the magnifying power of this telefcope is found the fame way as that of the laft above; *viz.* by dividing the focal diftance of the object-glafs *cd*, by the focal diftance of the eye-glafs *ik*, or *gh*, or *ef*, fince all thefe three are equal.

When the rays of light are feparated by refraction, they become coloured; and if they be united again, they will be a perfect white. But thofe rays which pafs through a convex glafs near its edges are more unequally refracted than thofe which are nearer the middle of the glafs. And when the rays of any pencil are unequally refracted by the glafs, they do not all meet again in one and the fame point, but in feparate points; which makes the image indiftinct, and coloured, about its edges. The remedy is, to have a plate with a fmall round hole in its middle, fixed in the tube at *m*, parallel to the glaffes. For, the wandering rays about the edges of the glaffes will be ftopt, by the plate, from coming to the eye; and none admitted but thofe which come through the middle of the glafs, or at leaft at a good diftance from its edges, and pafs through the hole in the middle of the plate. But this circumfcribes the image, and leffens the field of view, which would be much larger if the plate could be difpenfed with.

The great inconvenience attending the management of long telefcopes of this kind, has brought them much into difufe ever fince the reflecting telefcope was invented. For one of this fort, fix feet in length, magnifies as much as one of the other an hundred. It was invented by Sir *Ifaac Newton*, but has received confiderable improvements fince his time; and is now generally conftructed in the following manner, which was firft propofed by Dr. *Gregory*.

At the bottom of the great tube *TTTT*, (No. 26.) is placed the large concave mirrour *DUVF*, whofe principal focus is at *m*; and in its middle is a round hole *P*, oppofite to which is placed the fmall mirrour *L*, concave toward the great one; and fo fixed to a ftrong wire *M*, that it may be moved farther from the great mirrour, or nearer to it, by means of a long fcrew on the outfide of the tube, keeping its axis ftill in the fame line *Pmn* with that of the great one.—Now, fince in viewing a very remote object, we can fcarce fee a point of it but what is at leaft as broad as the great mirrour, we may confider the rays of each pencil, which flow from every point of the object, to be parallel to each other, and to cover the whole reflecting furface *DUVF*. But to avoid confufion in the figure, we fhall only draw two rays of a pencil flowing from each extremity of the object into the great tube, and trace their progrefs, through all their reflections and refractions, to the eye *f*, at the end of the fmall tube *tt*, which is joined to the great one.

Let us then fuppofe the object *AB* to be at fuch a diftance, that the rays *B* may flow from its lower extremity *B*, and the rays *E* from its upper extremity *A*. Then the rays *C* falling parallel upon the great mirrour at *D*, will be thence reflected converging, in the direction *DG*; and by croffing at *I* in the principal focus of the mirrour, they will form the upper extremity *I* of the inverted image *IK*, fimilar to the lower extremity *B* of the object *AB*: and paffing on to the concave mirrour *L* (whofe focus is at *n*) they will fall upon it at *g*, and be thence reflected converging, in the direction *gN*, becaufe *gm* is longer than *gn*; and paffing through the hole *P* in the large mirrour, they would meet fomewhere about *r*, and form the lower extremity *B* of the erect image *AB*, fimilar to the lower extremity *B* of the object *AB*. But by paffing through the plano-convex glafs *R* in their way, they form that extremity of the image at *b*. In like manner, the rays *E*, which come from the top of the object *AB*,

AB, and fall parallel upon the great mirrour at *F*, are thence reflected converging to its focus, where they form the lower extremity *K* of the inverted image *IK*, similar to the upper extremity *A* of the object *AB*; and thence passing on to the small mirrour *L*, and falling upon it at *b*, they are thence reflected in the converging state *bO*; and going on through the hole *P* of the great mirrour, they would meet somewhere about *q*, and form there the upper extremity *a* of the erect image *ab*, similar to the upper extremity *A* of the object *AB*: but by passing through the convex glass *R* in their way, they meet and cross sooner, as at *a*, where that point of the erect image is formed.—The like being understood of all those rays which flow from the intermediate points of the object between *A* and *B*, and enter the tube *TT*; all the intermediate points of the image between *a* and *b* will be formed; and the rays passing on from the image, through the eye-glass *S*, and through a small hole *e* in the end of the lesser tube *tt*, they enter the eye *f*, (which sees the image *ab* by means of the eye-glass) under the large angle *ced*, and magnified in length under that angle from *c* to *d*.

In the best reflecting telescopes, the focus of the small mirrour is never coincident with the focus *m* of the great one, where the first image *IK* is formed, but a little beyond it (with respect to the eye) as at *n*: the consequence of which is, that the rays of the pencils will not be parallel after reflection from the small mirrour, but converge so as to meet in points about *q,e,r*; where they would form a larger upright image than *ab*, if the glass *R* was not in their way; and this image might be viewed by means of a single eye-glass properly placed between the image and the eye; but then the field of view would be less, and consequently not so pleasant; for which reason, the glass *R* is still retained, to enlarge the scope or area of the field.

To find the magnifying power of this telescope, multiply the focal distance of the great mirrour by the distance of the small mirrour from the image next the eye, and multiply the focal distance of the small mirrour by the focal distance of the eye-glass; then, divide the product of the former multiplication by the product of the latter, and the quotient will express the magnifying power.

We shall here set down the dimensions of one of Mr. *Short*'s reflecting telescopes, as described in Dr. *Smith*'s optics.

The focal distance of the great mirrour 9.6 inches, its breadth 2.3; the focal distance of the small mirrour 1.5, its breadth 0.6; the breadth of the hole in the great mirrour 0.5; the distance between the small mirrour and the next eye-glass 14.2; the distance between the two eye-glasses 2.4; the focal distance of the eye-glass next the metals 3.8; and the focal distance of the eye-glass next the eye 1.1.

One great advantage of the reflecting telescope is, that it will admit of an eye-glass of a much shorter focal distance than a refracting telescope will; and, consequently, it will magnify so much the more: for the rays are not coloured by reflection from a concave mirrour, if it be ground to a true figure, as they are by passing through a convex glass, let it be ground ever so true.

The adjusting screw on the outside of the great tube fits this telescopes to all sorts of eyes, by bringing the small mirrour either nearer to the eye, or removing it farther; by which means, the rays are made to diverge a little for short-sighted eyes, or to converge for those of a long sight.

The nearer an object is to the telescope, the more its pencils of rays will diverge before they fall upon the great mirrour, and therefore they will be the longer of meeting in points after reflection; so that the first image *IK* will be formed at a greater distance from the large mirrour, when the object is near the telescope, than when it is very remote. But as this image must be formed farther from the small mirrour than its principal focus *n*, this mirrour must be always set at a greater distance from the large one, in viewing near objects, than in viewing remote ones. And this is done by turning the screw on the outside of the tube, until the small mirrour be so adjusted, that the object (or rather its image) appears perfect.

In looking through any telescope towards an object, we never see the object itself, but only that image of it which is formed next the eye in the telescope. For if a man holds his finger or a stick between his bare eye and an object, it will hide part (if not the whole) of the object from his view. But if he ties a stick across the mouth of a telescope before the object-glass, it will hide no part of the imaginary object he saw through the telescope before, unless it covers the whole mouth of the tube: for, all the effect will be, to make the object appear dimmer, because it intercepts part of the rays. Whereas, if he puts only a piece of wire across the inside of the tub, between the eye-glass and his eye, it will hide part of the object which he thinks he sees: which proves, that he sees not the real object, but its image. This is also confirmed by means of the small mirrour *L*, in the reflecting telescope, which is made of opake metal, and stands directly between the eye and the object towards which the telescope is turned; and will hide the whole object from the eye at *e*, if the two glasses *R* and *S* are taken out of the tube.

Of the Multiplying Glass.

The multiplying glass is made by grinding down the round side *bik* (No. 27.) of a convex glass *AB*, into several flat surfaces, as *hb*, *bld*, *dk*. An object *C* will not appear magnified when seen through this glass by the eye at *H*; but it will appear multiplied into as many different objects as the glass contains plane surfaces. For, since rays will flow from the object *C* to all parts of the glass, and each plane surface will refract these rays to the eye, the same object will appear to the eye in the direction of the rays which enter it through each surface. Thus, a ray *giH*, falling perpendicularly on the middle surface, will go through the glass to the eye without suffering any refraction; and will therefore shew the object in its true place at *C*: whilst a ray *ab* flowing from the same object, and falling obliquely on the plane surface *hb*, will be refracted in the direction *be*, by passing thro' the glass; and upon leaving it, will go on to the eye in the direction *eH*; which will cause the same object *C* to appear also at *E*, in the direction of the ray *He*, produced in the right line *Hen*. And the ray *cd*, flowing from the

the object C, and falling obliquely on the plane surface dk, will be refracted (by passing through the glass and leaving it at f) to the eye at H; which will cause the same object to appear at D, in the direction Hfm.—If the glass be turned round the line glH, as an axis, the object C will keep its place, because the surface bld is not removed; but all the other objects will seem to go round C, because the oblique planes, on which the rays ab cd fall, will go round by the turning of the glass.

Of the Camera Obscura.

The *camera obscura* is made by a convex-glass CD, (No. 28.) placed in a hole of a window-shutter. Then, if the room be darkened so, as no light can enter but what comes through the glass, the pictures of all the objects (as fields, trees, buildings, men, cattle, &c.) on the outside, will be shewn in an inverted order, on a white paper placed at GH in the focus of the glass; and will afford a most beautiful and perfect piece of perspective or landscape of whatever is before the glass, especially if the sun shines upon the objects.

If the convex glass CD be placed in a tube in the side of a square box, within which is the plane mirrour EF, reclining backwards in an angle of 45 degrees from the perpendicular kq, the pencils of rays flowing from the outward objects, and passing through the convex glass to the plane mirrour, will be reflected upwards from it, and meet in points, as I and K (at the same distance that they would have met at H and G, if the mirrour had not been in the way,) and will form the aforesaid images on an oiled paper stretched horizontally in the direction IK; on which paper, the out-lines of the images may be easily drawn with a black-lead pencil; and then copied on a clean sheet, and coloured by art, as the objects themselves are by nature.—In this machine, it is usual to place a plane glass, unpolished, in the horizontal situation IK, which glass receives the images of the outward objects; and their outlines may be traced upon it by a black-lead pencil.

N. B. The tube in which the convex glass CD is fixed, must be made to draw out, or push in, so as to adjust the distance of that glass from the plane mirrour, in proportion to the distance of the outward objects; which the operator does, until he sees their images distinctly pointed on the horizontal glass at IK.

The forming a horizontal image, as IK, of an upright object AB, depends upon the angles of incidence of the rays upon the plane mirrour EF, being equal to their angles of reflection from it. For, if a perpendicular be supposed to be drawn to the surface of the plane mirrour at e, where the ray $AaCe$ falls upon it, that ray will be reflected upwards in an equal angle with the other side of the perpendicular, in the line edI. Again, if a perpendicular be drawn to the mirrour from the point f, where the ray Abf falls upon it, that ray will be reflected in an equal angle from the other side of the perpendicular, in the line fhI. And if a perpendicular be drawn from the point g, where the ray Acg falls upon the mirrour, that ray will be reflected in an equal angle from the other side of the perpendicular, in the line giI. So that all the rays of the pencil abc, flowing from the upper extremity of the object AB, and passing through the convex glass CD, to the plane mirrour EF, will be reflected from the mirrour, and meet at I, where they will form the extremity I of the image IK, similar to the extremity A of the object AB. The like is to be understood of the pencil qrs, flowing from the lower extremity of the object AB, and meeting at K (after reflection from the plane mirrour) the rays form the extremity K of the image, similar to the extremity B of the object: and so of all the pencils that flow from the intermediate points of the object to the mirrour, through the convex glass.

Of the Opera-Glass.

If a convex glass, of a short focal distance, be placed near the plane mirrour in the end of a short tube, and a convex glass be placed in a hole in the side of the tube, so as the image may be formed between the last mentioned convex glass and the plane mirrour; the image being viewed through this glass, will appear magnified.—In this manner, the *opera-glasses* are constructed; with which a gentleman may look at any lady at a distance in the company, and the lady know nothing of it.

Of the Common Looking-Glass.

The image of any object that is placed before a plane mirrour appears as big to the eye as the object itself; and is erect, distinct, and seemingly as far behind the mirrour, as the object is before it: and that part of the mirrour, which reflects the image of the object to the eye (the eye being supposed equally distant from the glass with the object) is just half as long and half as broad as the object itself. Let AB (No. 29.) be an object placed before the reflecting surface ghi of the plain mirrour CD; and let the eye be at o. Let Ah be a ray of light flowing from the top A of the object and falling upon the mirrour at h, and hm be a perpendicular to the surface of the mirrour at h; the ray Ah will be reflected from the mirrour to the eye at o, making an angle mho equal to the angle Ahm: then will the top of the image E appear to the eye in the direction of the reflected ray oh produced to E, where the right line ApE, from the top of the object, cuts the right line ohE, at E. Let Bi be a ray of light proceeding from the foot of the object at B to the mirrour at i; and ni a perpendicular to the mirrour from the point i, where the ray Bi falls upon it: this ray will be reflected in the line io, making an angle nio, equal the angle Bin, with that perpendicular, and entering the eye at o; then will the foot F of the image appear in the direction of the reflected ray oi, produced to F, where the right line BF cuts the reflected ray produced to F. All the other rays that flow from the intermediate points of the object AB, and fall upon the mirrour between h and i, will be reflected to the eye at o; and all the intermediate points of the image EF will appear to the eye in the direction of these reflected rays produced. But all the rays that flow from the object, and fall upon the mirrour above h, will be reflected back above the eye at o; and all the rays that flow from the object, and fall upon the mirrour below i, will be reflected back below the

the eye at o: so that none of the rays that fall above h, or below i, can be reflected to the eye at o; and the distance between h and i is equal to half the length of the object AB.

Hence it appears, that if a man sees his whole image in a plane looking-glass, the part of the glass that reflects his image must be just half as long and half as broad as himself, let him stand at any distance from it whatever; and that his image must appear just as far behind the glass as he is before it. Thus, the man AB (No. 30.) viewing himself in the plane mirrour CD which is just half as long as himself, sees his whole image as at EF, behind the glass, exactly equal to his own size. For, a ray AC, proceeding from his eye at A, and falling perpendicularly upon the surface of the glass at C, is reflected back to his eye, in the same line CA; and the eye of his image will appear at E, in the same line produced to E, beyond the glass. And a ray BD, flowing from his foot, and falling obliquely on the glass at D, will be reflected as obliquely on the other side of the perpendicular abD, in the direction DA; and the foot of his image will appear at F, in the direction of the reflected ray AD, produced to F, where it is cut by the right line BGF, drawn parallel to the right line ACE. Just the same as if the glass were taken away, and a real man stood at F, equal in size to the man standing at B: for to his eye at A, the eye of the other man at E would be seen in the direction of the line ACE; and the foot of the man at F would be seen by the eye A, in the direction of the line ADF.

If the glass be brought nearer the man AB, as suppose to cb, he will see his image as at CDG: for the reflected ray CA (being perpendicular to the glass) will shew the eye of the image as at C; and the incident ray Bb, being reflected in the line bA, will shew the foot of his image as at G; the angle of reflection abA being always equal to the angle of incidence Bba: and so of all the intermediate rays from A to B. Hence, if the man AB advances towards the glass CD, his image will approach towards it; and if he recedes from the glass, his image will also recede from it.

Of the Magic Lantern.

ABCD (No. 31.) is a tin lantern, with a tube $nklm$ fixed in the side of it. This tube consists of two joints, one of which slips into the other: and by drawing this joint out, or pushing it in, the tube may be made longer or shorter. At kl in the end of the moveable joint of the tube a convex lens is fixed, and an object painted with transparent colours upon a piece of thin glass is placed at de somewhere in the immoveable joint of the tube; so that as the tube is lengthened or shortened, the lens will be either at a greater or a less distance from this transparent object. In the side of the lantern there is a very convex lens bbc, which serves to cast a very strong light from the candle within the lantern upon the object de Now when the rays, which shine through the object de, diverge from the several points as d, e, &c. in the object, and fall upon the lens kl, they will be made to converge to as many points f, g, &c. on the other side of the lens, and will paint an inverted picture of the object at fg upon a white wall, a sheet or a screen of white paper, provided the object is farther from the lens than its principal focus. To make this picture appear distinct and bright, it must have no other light fall upon it but what comes through the lens kl; and for this reason the whole apparatus is to be placed in a dark room EFGH. The lens kl must be very convex, so that the object de may be very near to it, and yet not be nearer than its principal focus: for by this means, as the object is near to the lens, the picture fg will be at a great distance from it, and consequently the picture will be much bigger than the object. Since the picture is inverted in respect of the object, in order to make the picture appear with the right end upwards, it is necessary that the object de should be placed with the wrong end upwards.

Of the Different Refrangibility *of* Light.

We have hitherto supposed that a particle of light, as it comes from the sun, is the least particle into which light can be separated. But we must now correct this supposition, by shewing, that a particle of light, as it comes from the sun, is, properly speaking, a bundle of rays, which may be separated from one another. Therefore, for the future, by a ray of light we must be understood to mean, not that collection of particles which we have hitherto called by this name, but the least particles into which light can be separated.

Rays of light are said to be differently refrangible, when at the same or equal angles of incidence some are more turned out of the way than others.

Rays are said to be differently reflexible, if some are more easily reflected than others.

Light is called homogeneous, when all the rays are equally refrangible: it is called heterogeneous, when some rays are more refrangible than others.

The colours of homogeneous light are called primary or simple colours; and those of heterogeneous light are called secondary or mixed.

The rays of the sun are not all equally refrangible: and those rays, which have a different degree of refrangibility, have likewise a different colour.

If a beam of light SF, (No. 32.) that comes from the sun, passes into a dark room through F a round hole in a window shutter EG; this beam proceeding straight forwards, and falling upon a paper at Y, would there make a round picture of the sun. This picture would be a confused one indeed, if the hole is a large one and there is no lens in the hole. However, as this round spot of light is a picture of the sun, we shall hereafter, notwithstanding its confusion, call it by this name. Now if a glass prism ABC is placed between the hole in the window-shutter and the paper at Y, the rays of this beam, by the refraction which they suffer in the prism, will be bent from their strait course, and instead of going on so as to fall upon the paper at Y, they will be turned upwards, and the picture of the sun produced by them will fall upon a paper MN that is placed above Y. If all the rays were

were equally bent upwards, the picture would be a round one upon the paper MN, after the rays have been refracted, as well as when they passed straight forwards and fell upon a paper at Y. But this refracted picture PT is found to be oblong. The horizontal diameter or breadth of this oblong picture is equal to the diameter of the circular one Y: but the perpendicular diameter or height of the picture PT is much greater than its breadth. The refraction is made upwards, and not in a horizontal direction: therefore no alteration ought to be made in the breadth or horizontal diameter of the picture; because no refraction, that is not in the direction of that diameter, can make the picture either broader or narrower. And if all the rays were equally refracted upwards, such a refraction would not change the length of the picture; as it is round when it falls at Y, so it would be round when it is refracted upwards by the prism and falls at PT. This oblong picture consists therefore of rays, which are differently refrangible: they all fall at equal angles of obliquity upon BC the first side of the prism, but in the refraction some are more turned out of the way than others: those rays which go to P, the upper part of the picture, are the most refrangible; and those which go to T, the lower part of it, are least refrangible: the rest, which fall between P and T, have intermediate degrees of refrangibility.

This oblong picture is of different colours in different parts of it. The most refrangible rays at P are violet, the least refrangible at T are red; the rays of intermediate refrangibility from the violet downwards to the red are indigo-coloured, blue, green, yellow, and orange. So that the whole picture is made up of rays of these seven different colours. We may from hence see the reason why the coloured picture consisting of differently refrangible rays should be oblong, in such a manner that the two sides of it are right lines, and the two ends semicircles. For it consists (as in No. 33.) of seven circles, the highest of which PAGQ is violet, the lowest STN is red, the five intermediate ones, BH, CI, DK, EL, OM, are indigo coloured, blue, green, yellow, and orange. The white round picture Y, (No. 32.) is formed by heterogeneous rays, that are of seven different sorts, distinguished from one another by their different degrees of refrangibility and different colours. The refraction of the prism separates these rays from one another by refracting some of them more and others less. And consequently the refracted picture will consist of seven round pictures one below another. These round pictures are so near to each other, that the highest of them APGR will mix itself with some of those below it, as with BH and CQI. This nearness of these several round pictures to each other will prevent their colours from being distinctly seen; it will likewise make the sides AS, GN, which are composed of small arcs of circles very close to one another, appear like right lines; but the two ends P and T will be semicircles.

If the centres of these circles continue at the same distance from one another, and the circles themselves are made less, as *apg*, *bh*, *ci*, *dk*, *el*, *om*, *stn*, they will then be distinct or will not mix with each other; and as the colours of the several parts will by this means be kept separate, so the refracted rays, instead of forming one continued oblong picture, will form seven small circular ones placed in a line perpendicular to the horizon. This separation of the several parts in the refracted picture from each other is brought about, (as in No. 34.) by making the hole F in the window-shutter very small, and by collecting the rays that come through it with a convex lens MN. For this will make a very small white picture of the sun at L, if there is no prism *abc*: but the refraction of this prism, if it is placed a little beyond the lens, will separate the heterogeneous rays by refracting them upwards; and instead of one small round and white picture at L, there will be seven small round pictures at PT, of which *r* will be violet, *s* indigo, *u* blue, *x* green *l* yellow, *y* orange, and *z* red.

That the prism ABC (No. 32.) does not make the rays diverge, so as to spread over the space PT, upon any other account but their different refrangibility, will be evident, if (as in No. 35.) a second prism DH is placed beyond the first *abc*. For if the rays that come from S and pass through the hole F of the window-shutter EG, were by the first prism *abc* made to diverge and form the oblong picture PT upon any other account besides their different refrangibility; then, supposing a second prism DH to be placed at right angles to the former, the effect must be this; the first prism *abc* makes the rays diverge from one another in a line PT perpendicular to the horizon, and consequently the second prism DH must make them diverge from one another in a line parallel to the horizon; so that the second prism would increase the breadth of the picture, as much as the first increased its length; and as one prism alone makes the picture a long one, both of them together would make it square, as *prst*. But this second refraction does not alter the figure of the picture, but only the position of it: the second prism refracts the picture sideways; and those rays, which fell the highest at P after the first refraction, are refracted sideways the most by the second prism; those which fell the lowest at T are refracted sideways the least; by which means the picture, though it continues oblong, will not be perpendicular to the horizon as PT was, but will be inclined so as to lie in the position *pt*. This makes it evident, that the spreading of the rays by the first refraction was owing to their different refrangibility, and to no other cause. It must be owing to their different refrangibility, because those which were most refracted upwards by the first prism are most refracted sideways by the second. It cannot be owing to any other cause, because if it was, the second prism would spread the rays in breadth as much as the first prism spreads them in length, and both prisms would make the picture square.

Those rays of light, which are most refrangible, are likewise most reflexible.

When a beam of light is admitted into a dark chamber through the hole F in the window-shutter EG, (No. 36.) and this beam falls upon a prism ACB, the sides of which AC and AB are equal, and the angle at A a right one; when the obliquity of these rays, as they are to pass out of the prism at its base BC, is less than 40 degrees, the greatest part of the beam will pass out, but some few rays will

will be reflected at the furface BC. The rays, which pafs through the bafe, form an oblong coloured picture HK, where MH is a more refrangible ray, and MK a lefs refrangible one. If the few rays of the beam, which are reflected from M in the direction MN, are made to pafs through another prifm XYV, they will likewife form an oblong coloured picture *pt*, where *p* is the moft refrangible and *t* the leaft refrangible ray. This picture will be a very faint one, becaufe there are but few rays reflected from M.

Now if the prifm ACB is turned flowly round upon its axis in the direction ACB, the obliquity of the rays EM to the bafe BC will keep increafing, till at laft this obliquity may become fo great, that no rays will pafs out at M, but all of them will be reflected. When this total reflection is made, the oblong picture *pt*, which was faint before, will become much brighter, becaufe then not only a few rays, but all the beam, will be reflected thither. This total reflection will not be made all at once; but as the prifm is turned flowly round upon its axis, the moft refrangible rays MH will be firft reflected, for the violet colour will difappear in the oblong picture HK, whilft all the other colours continue as bright as they were before; and when this colour difappears at HK, the fame colour at *p* will become bright, and all the other colours at *pt* will continue as faint as they were before. When the prifm is turned a little farther upon its axis, the indigo colour, which confifts of rays that have the next greateft degree of refrangibility, will be reflected, fo that this colour will difappear at HK and will become bright at *pt*. The fame thing will happen to all the rays in their order; as the prifm is turned round, each different fort of rays will be reflected fooner as the rays have a greater degree of refrangibility, or latter as they have a lefs degree. The red rays at K, which are the leaft refrangible of all, will be reflected laft of all. From hence therefore it appears, that the rays of the fun are differently reflexible, and that thofe which are moft refrangible are likewife moft reflexible.

Homogeneous light is refracted regularly without any dilatation or fcattering of the rays.

When the rays of any one particular colour in the oblong picture of the fun, as the green rays, for inftance, are feparated from one another; if fome of thefe green rays which are homogeneal, or are all equally refrangible, are tranfmitted through a very fmall round hole in a ftiff pafteboard, and are refracted by a prifm on the other fide of the hole, the picture formed by thefe green rays after refraction upon a white paper held beyond the prifm will not be oblong, but circular, as the hole is through which they paffed. Therefore this homogeneous light is not dilated, nor are the rays of it fcattered by this refraction.

The confufed appearance of objects, when they are feen through refracting bodies, is owing to the different refrangibility of light.

If flies, or the letters of a fmall print, or any other minute objects, are placed in heterogeneal light, fuch as a direct beam of the fun's, which has never been feparated by any refraction into its homogeneous parts; thefe objects being viewed through a glafs-prifm will be feen confufedly, their edges will appear fo mifty that the fmaller parts of minute animals cannot eafily be diftinguifhed from one another, and the letters of the fmall print cannot be read. But if the fame objects are placed in a beam of homogeneous light, which is feparated from all other rays of a different refrangibility in the manner already defcribed, they will appear as diftinct through a prifm as if they were viewed with the naked eye. Therefore we may conclude, that this confufion is owing to the different refrangibility of thofe rays which come from the objects; fince objects never appear confufed when they are feen through refracting bodies, unlefs they are enlightened with feveral forts of rays which have different degrees of refrangibility.

It is probable that any fingle ray of the leaft refrangible fort contains a greater quantity of matter than any fingle ray of the moft refrangible fort.

We have already feen, that at the fame angles of incidence violet rays will be more refracted or more turned out of the way than red rays. And we have likewife feen, that rays are refracted when they pafs out of one medium into another, by being either more or lefs attracted in one medium than they are in the other. Now fince, when all other circumftances are equal, when red rays and violet rays fall at equal obliquities, and are to pafs out of glafs into air, fo that the mediums, and confequently the attractive force or caufe of refraction, is given; if the fame caufe can turn the violet rays more out of the way, or refract them more, than it does the red rays, thefe rays muft have different moments; the moft refrangible rays, or thofe which are moft eafily turned out of the way, have the leaft moment; and the leaft refrangible rays, or thofe which are moft difficult to turn out of the way, have the greateft moment. But if all forts of rays have the fame velocity, their refpective quantities of matter will be as their moments; and confequently any fingle ray of the moft refrangible fort contains a lefs quantity of matter than any fingle ray of the leaft refrangible fort.

It may be upon this account that a red colour, or a pale purple, is lefs pleafant to the eye than a blue, green, or a yellow. The red rays ftrike the eye with fo great a force as to be offenfive to it; and the fmall force of the pale-purple ones will produce too faint a fenfation to be agreeable. The intermediate colours are therefore more pleafant to the eye, as the force of the rays is neither too great to be offenfive, nor too fmall to produce a quick and lively fenfation.

The colours of homogeneous light are fo invariable, that neither any refraction nor any reflection can alter them.

If a beam of homogeneous light paffes through a round hole in a pafteboard, and then is refracted by a prifm on the other fide of the hole, this refraction will make no alteration in the colour of the rays; if they were red, or whatever was their colour, before they entered the prifm, their colour will ftill be the fame, when they have paffed through it, and fall upon a white paper held beyond the prifm. This proves the firft part of the propofition, that the

the colours of homogeneous light are to be changed by any refraction.

Red lead, when it is viewed in open day-light, or when heterogeneous rays fall upon it, will likewise be red, if it is placed in homogeneous red light: but red lead, when it is placed in any other sort of homogeneous light, will have the same colour with the rays that fall upon it and are reflected from it: if it is placed in yellow homogeneous light, it will be yellow; if in green light, it will be green; or if in blue light, it will be blue. Consequently the reflection of the rays from the red lead make no alteration in their colour; for if it did, rays of any sort reflected from the lead would be of the same colour, so that it would appear red in whatever sort of light it was placed. The same that is here said of red lead, is true of any other substance of any other colour. Grass, which is green either in open day-light or in homogeneous green light, will not change the colour of any homogeneous rays by reflecting them, but will itself have the same colour with the rays in which it is placed; it will be red in red light, or blue in blue light, or yellow in yellow light.

From hence we may conclude, by the way, that a body is of any particular colour, not because it reflects no other rays but those of that particular colour, but because it reflects those more copiously and others more sparingly. Red lead, as it appears red in red light, so in green light it appears green, or in blue light it appears blue: consequently it reflects rays of these sorts, and in the same manner it might be shewn to reflect all other sorts of rays. But then the red colour of red lead, when it is placed in red light, is much brighter than any other colour will be that it puts on by being placed in another sort of light: consequently it reflects red rays more copiously than any other sort of rays; and for this reason, when it is placed in open day-light, where it reflects all sorts of rays at once, the red rays are so much more numerous than the rest, as to make the whole mixture of their own colour.

Colours may be produced by composition, which shall in appearance be like the colour of homogeneous light: but then these compound colours will be altered by refraction.

When, by means of two holes in the window-shutter of a dark room and of two prisms, two oblong coloured pictures are produced; if a circular piece of white paper is so placed that the red light of one picture and the yellow light of the other may fall upon it, this mixture will produce an orange colour, that in appearance will be like the primary orange colour. But between the simple and compound colour, though they are alike in appearance, there will be this difference; if the circular piece of paper, when it is enlightened with compound orange, is viewed through a prism, the rays will be found to be differently refrangible, and they will, by the refraction of the prism, be so separated from one another, that the paper seen through it will appear as two circles, one of which will be red and the other yellow; whereas, if the same paper, when it is enlightened with simple or primary orange, is viewed in like manner through a prism, the rays will be found to be equally refrangible, and the paper will appear through the prism, as it does to the naked eye, to be one orange-coloured circle distinctly terminated all round. After the same manner other homogeneous colours, as blue and yellow, when mixed together, will produce a a new compound colour like the intermediate homogeneous green colour in appearance. But then the rays of this compound green will not be all of them equally refrangible, as the rays of the simple or primary green colour are.

The whiteness of the sun's light is compounded of all the primary colours mixed in a due proportion.

Let the oblong coloured picture (No. 37.) fall upon the convex lens MN; and then all the rays which are separated from one another at PT will be collected together by passing through the lens, and will meet at its focus G, in such a manner as to form a round picture of the sun upon a white paper DE. This round picture, which consists of rays of all sorts, of red, orange, yellow, blue, green, indigo, and violet, is white. And this whiteness is compounded of all the primary colours mixed together. None of the rays change their colour by being mixed with the rest; each sort retains the same colour after it is mixed with the rest that it had before; neither the red rays, nor the orange, nor the yellow, nor the blue, nor the green, nor the indigo, nor the violet, are made white by being mixed with the rest at the focus; but though none of the parts are white, yet the whole mixture is white.

That the whiteness at the focus G arises from a mixture of all the primary colours, is evident. For if any of the colours are intercepted at the lens, the focus loses its whiteness, and becomes of that colour which arises from a mixture of those which are not intercepted. Thus if all the rays at PT are intercepted except the yellow, the orange, and the red, the focus will not be white, but will be orange-coloured. If all the rays are intercepted at PT, except the blue, the green, and the yellow, the focus will then be green. The orange in one case, and the green in the other case, is the compound colour arising from a mixture of those rays which are not intercepted. And in either case, if the rays that were intercepted are again suffered to pass through the lens, the focus will recover its whiteness.

It may be more difficult to shew that the rays, when they are all of them mixed at the focus, retain their proper colours, and are none of them white though the compound mixture is white. To make this out, let the paper be removed from DE, where all the rays are mixed upon it at G, to *de*, where it will receive the rays, after they have crossed one another at the focus, and having got beyond it diverge again. In this position of the the paper, because the rays that were mixed at the focus have diverged from thence, and are again separated from one another, the oblong coloured picture will appear again at *tp*, so that the red colour T, which was the lowest at the lens, will be the highest at the paper *de*. But though the colours are thus inverted by passing the focus, yet all of them appear at *tp*; which would have been impossible, if each sort of rays, by being mixed with the rest at the focus, had lost their colour, and had been made white. Nor indeed is the colour of any sort of rays at all changed by being mixed with the rest at the focus; but the

the ſame rays that produced any particular colour in the oblong picture PT are the rays that produce the ſame colour in the inverted picture *tp*; as would be evident from intercepting any particular colour at PT: for if the green rays, for inſtance, are intercepted at PT, there will be no green at *tp*: or if the red are intercepted at PT, there will then appear no red colour at *tp:* and the ſame thing will happen upon intercepting the rays of any other colour at PT, for then that colour will vaniſh at *tp*.

Colours may be produced by compoſition that are neither exactly like any of the primary ones, nor fully white.

If the red rays of one coloured picture are mixed with the violet rays of another, according to the various proportions in which they are mixed, various purples will be produced, ſuch as are not like in appearance to the colour of any homogeneous light; and of theſe purples, mixed with yellow and blue, may be made other new colours.

By mixing the coloured powders which painters uſe, though the powders themſelves reſemble the primary colours, yet the mixture may be grey, or dun, or ruſſet-brown, ſuch as are the colours of a man's nail, of a mouſe, of aſhes, of ordinary ſtones, of mortar, of duſt and dirt in the high-ways. Thus one part of red lead, and five of viride æris, compoſe a dun colour like that of a mouſe. If to orpiment, which is yellow, a full bright purple powder uſed by painters is added, the mixture may be made of a pale red; and with the addition of a little viride æris, which, as the name imports, is green, and of a little blue biſe, this pale red will change to grey or pale white, ſuch as is the colour of aſhes, or of wood newly cut, or of a man's ſkin.

Theſe grey, dun, and ruſſet colours are only imperfect ſorts of white. And we may underſtand, why the mixture of theſe coloured powders ſhould produce an imperfect white, and not a full bright one, from the following obſervation. All coloured powders ſuppreſs and ſtop great part of the light that falls upon them: they reflect more of thoſe rays from whence their colour ariſes than of any other ſort; but they reflect even thoſe more ſparingly than white bodies do. Red lead, for inſtance, reflects fewer red rays than white paper does; for if red lead and white paper are both of them placed in homogeneous red light, the paper will appear of a brighter red than the lead. But if red lead ſuppreſſes many red rays, it may well be ſuppoſed to ſuppreſs many more rays of other colours; ſince its redneſs is owing to its reflecting red rays more copiouſly, and all other rays more ſparingly. From hence it follows, that in a mixture of coloured powders, though they reflect rays of all ſorts in a due proportion, ſo that the compound light will not be more of one colour than another, but will be white; yet the whiteneſs will be much leſs bright than that of paper; becauſe the mixture of powders ſuppreſſes and ſtops many rays, whereas the paper reflects almoſt all the rays that fall upon it, and ſuppreſſes ſcarce any. Thus the whiteneſs in the mixture of powders, and the whiteneſs in the paper, are both of the ſame ſort, and differ from one another only in degree, or in the quantity of light. Therefore, if ſome of this mixture of powders is placed in bright ſunſhine, and a piece of white paper is placed in the ſhade, the mixture by thus increaſing the light, and the paper by thus diminiſhing it, may be made to appear equally white.

The colours of all bodies are either the ſimple colours of homogeneous light, or ſuch compound colours as ariſe from a mixture of homogeneous light.

Each ſort of light has a peculiar colour of its own, which no refraction or reflection can change. Therefore the colour of no natural body can be any other than either the colour of ſome ſort of homogeneous light, or a compound colour ariſing from a mixture of the ſeveral ſorts. For bodies appear coloured only by reflecting light; and no reflection can give any other colours to the rays but what they had before.

Of the Colours *of* thin transparent Plates.

Water, air, glaſs, or any other tranſparent ſubſtance, when drawn out into thin plates, become coloured.

Water, when it is made tenacious by having ſoap mixed with it, may be blown up into a bubble A, (No. 38.) ſuch as children play with. If this bubble is ſet under a glaſs, ſo that the motion of the air may not affect it, then as the water glides down the ſides of it, and the top of it at A grows thinner, ſeveral colours will ſucceſſively appear at A, and will ſpread themſelves from thence in rings ſurrounding A, and deſcending farther and farther down the ſides of the bubble, till they vaniſh at BC in the ſame order in which they appeared. Thus, for inſtance, the firſt colour that appears at A, the top of the bubble, is red: this red ſpot ſpreads itſelf into a circular ring round A, and then the top of the bubble A becomes blue: this blue ſpot ſpreads itſelf in the ſame manner round A, and then A becomes red a ſecond time. Before we go on to conſider what other colours ariſe at A, we will obſerve what becomes of thoſe which ariſe firſt. The red, which firſt appeared at A, ſpreads itſelf into a circular ring round A: this ring grows larger, as the water glides down the ſides of the bubble; ſo that the coloured ring glides down the bubble along with the water, till it ſinks at laſt to BC, and there encompaſſes the bubble. In like manner the blue, which ariſes at A after the red, ſpreads itſelf and deſcends down the bubble, as the red ring did. The colour which ariſes next at A, is red a ſecond time; this ſpreads itſelf in the ſame manner, and is ſucceeded by blue a ſecond time. Theſe are followed by a great variety of colours, which appear ſucceſſively at A, and ſpread themſelves from thence in this order: Red, yellow, green, blue, purple; then again red, yellow, green, blue, violet; and laſtly, red, yellow, white, blue. This laſt blue colour is ſucceeded at A by a black ſpot, which reflects ſcarce any light: this ſpot dilates itſelf, but not into a circular ring as the colours had done; it becomes broader and broader, till the bubble breaks.

A thin plate of water of the ſame ſort with this bubble, but more laſting, may be otherwiſe procured. If a piece of plane poliſhed glaſs is placed upon the object-glaſs of a long teleſcope, as in (No. 39.) the plane ſurface of one glaſs, and the convex one of the other, will touch one another only at a ſingle point; and if the interval between them is filled with water, as the glaſſes are preſſed together, the ſame colours ariſe at the point of contact

contact, and ſpread themſelves in circular rings round it in the ſame order as in the ſoap-bubble. If BC (No. 40.) is a ſection of the plane glaſs, and DAE a ſection of the convex one; when they are preſſed cloſe together, the thin plate of water that fills the interval between them will have a black ſpot at A; and this ſpot will be encompaſſed with rings of colours, in the ſame order that they ſtand in that figure upon the line BC, on each ſide of A. If the colours are reckoned in the order in which they ſtand on the plate of water after the black ſpot appears at A, and we reckon them from the ſpot A towards the edges of the plate at B and C; then we muſt call blue the firſt colour. But if we reckon them in the order in which they aroſe at A, and ſpread themſelves; then we muſt begin from B or C, the edges of the plate, and go on towards A, and in this reckoning we muſt call red the firſt colour.

If there is no water between the two glaſſes, then the interval will be filled with air, and this thin plate of air will have the ſame colours that the plate of water had; with this difference only, that each of the coloured rings is larger in the plate of air than in the plate of water.

When glaſs is blown very thin at a lamp-furnace, thin plates of it thus formed will exhibit colours; and ſo likewiſe will thin plates of Muſcovy-glaſs. Metals, when they are heated, ſend out to their ſurfaces ſcoria or vitrified parts, which cover the metals in form of a thin ſkin; and theſe ſcoria or thin plates cauſe colours upon the ſurface of the metal, ſuch as are made to appear on poliſhed ſteel by heating it, or on bell-metal by melting it firſt and then pouring it on the ground to cool in the air.

When the thin plate is denſer than the medium that ſurrounds it, the colours are more vivid than they are when the plate is rarer than that medium.

A thin bubble is a plate of water encompaſſed with air; where the ſubſtance of the plate, which is water, is denſer than the air, which is the medium that ſurrounds it. On the contrary, the plate of air between the two glaſſes BAC, DAE, (No. 40.) is encompaſſed with glaſs; and here the ſubſtance of the plate is rarer than that of the circumambient medium; and the colours on the bubble of water are more vivid than thoſe on the thin plate of air.

When thin tranſparent plates reflect one ſort of rays, they tranſmit the reſt.

If the plate of air between the two glaſſes BAC, DAE, (No. 40.) is viewed by reflected light, the colours of it are thoſe expreſſed on the upper part of the figure from B to C; but if we look through it, that is, if we view it by tranſmitted light, or if the tranſmitted light falls upon a white paper, the colours that we ſee through the plate, or that fall on the paper, are thoſe expreſſed on the lower part of the figure. Now, any of the tranſmitted colours are what would ariſe from a mixture of all the remaining rays, after thoſe of the reflected colour are ſeparated from the ſun's heterogeneal light. Thus, for inſtance, the fourth reflected colour from the black ſpot A incluſively is yellow, the tranſmitted colour is violet. The yellow rays, and ſome of the orange and green, are reflected here, ſo that the mixture of the reflected light will be yellow. The mixture of the tranſmitted light therefore will be violet, or rather ſuch a purple as is not exactly like any of the primary colours; for we obſerved, that from red rays, violet, and blue, new purples may be produced.

This is the caſe in ſome natural bodies, as well as in theſe tranſparent artificial plates; for if leaf-gold, which is made thin enough to tranſmit light, is held againſt the ſtrong light of the ſun's rays, the gold, which is yellow when ſeen by the reflected light, will be blue when thus ſeen by tranſmitted light.

The ſeventh reflected colour incluſively from the black ſpot is blue, the ſeventh tranſmitted colour is yellow. When the rays which make the blue colour are taken out of the ſun's heterogeneous light, the remaining rays will be yellow. Thus it happens likewiſe in ſome natural bodies; for an infuſion of lignum nephriticum, which is blue when ſeen by reflected light, is yellow when ſeen by tranſmitted light.

The black ſpot A reflects ſcarce any light: and as rays of all colours are tranſmitted there, the tranſmitted colour is white; the third reflected colour from the black ſpot incluſively is white. Therefore, ſince all the rays are reflected there, no colour ought to be ſeen there, when we look through the plate; and accordingly that part of the plate is black.

Hence we ſee the reaſon why, if there be two liquors of full colours in two different glaſs veſſels, ſuppoſe red and blue; though each is tranſparent when we look thro' it ſeparately, yet we ſhould not be able to ſee through both of them together if one was held behind the other. For if the blue liquor, for inſtance, is held towards the light, and the red towards the eye; ſince only blue rays paſs through the firſt liquor, and come to the ſecond; and ſince the ſecond liquor will tranſmit no blue rays, but only red ones; it follows, that no rays at all can come to the eye.

Indeed ſome tranſparent bodies appear of the ſame colour, whether we ſee them by reflected or tranſmitted light. Of this ſort is moſt painted glaſs. But when this is the caſe, the coloured rays are reflected from the ſecond ſurface of the body. Thus, if a piece of painted glaſs is yellow either when ſeen by reflected light or when ſeen by tranſmitted light, all the rays but the yellow ones are ſuppreſſed as they paſs through the glaſs: of the yellow rays, moſt are tranſmitted at the ſecond ſurface; the few which are reflected from thence will be ſufficient to tinge all the light yellow, which is reflected from the firſt ſurface. This will be evident from making the body thick, and pitching it on the backſide: for by this means the reflected colour will be loſt; whereas, if it had been reflected from the firſt ſurface, the pitch at the ſecond ſurface could not have altered it.

The more denſe the ſubſtance is out of which a thin plate is made, the leſs is the thickneſs of the plate where it reflects any certain colour.

The colours are the ſame whether there is air or water between the two glaſſes BAC, DAE, (No. 40.) only the coloured circles are ſmaller in the plate of water than in the plate of air. Thus the yellow, for inſtance, which is the fourth coloured circle from the black ſpot, is a leſs circle, or is nearer to the black ſpot, when there is a plate of water between the glaſſes, than when there is a plate

plate of air between them. But the lefs the diftance from the point of contact A, the clofer the glaffes are to one another, and confequently the thinner will be the plate that lies between them; confequently that part of a plate of water where this yellow appears, is thinner than that part of a plate of water where the fame colour appears. And the fame holds good in any other colour. But water is more denfe than air: therefore, the more denfe the fubftance is out of which a thin plate is made, the lefs is the thicknefs of the plate where it reflects any certain colour.

The fort of colour, which is reflected from any part of a thin plate, depends only upon the thicknefs of the plate itfelf in that part: but the fame colour will be made lefs vivid by increafing the denfity of the medium with which the plate is encompaffed.

The colours upon any part of a thin plate of Mufcovy glafs are the fame in fort, whether the plate is dry or wetted with water. Therefore the fort of colour in any part depends not upon the medium that encompaffes the plate, but upon the thicknefs of the plate itfelf; fince the colours are the fame when the plate is dry and encompaffed with air, or wet and fo encompaffed with water. But the fame colours are more faint when the plate is wet, than when it is dry; and confequently, the brightnefs of the colours does depend upon the medium that encompaffes the plate; and the denfer that medium is, the fainter will be the colours; they are are more faint when the plate is covered with water than when it is dry and fo is furrounded with air.

The rays of light have alternate fits of eafy reflection and eafy tranfmiffion, which return at equal intervals.

Let GF, (No. 41.) be a beam of homogeneous light confifting all of one fort of rays, as fuppofe all the rays that compofe the beam were red ones. Then, if thefe rays fall upon a thin plate of air between the two glaffes BAC, DAE, at A there will be a dark fpot, and all the rays will be tranfmitted: round this fpot there will be a red ring, where all the rays are reflected; round this red ring there will be a dark ring, where all the rays are tranfmitted. And if the thicknefs of of the plate where all the rays are reflected in the ring neareft to A is called 1, the thicknefs where the dark ring appears and all the rays are tranfmitted will be 2. Again, at that part of the plate where the thicknefs is 3, all the rays will be tranfmitted: at the thicknefs 4, they will be all reflected. And thus alternately, as expreffed by the lines in the figure, the rays will be reflected in all parts of the plate where the thicknefs is expreffed by any of the uneven numbers 1, 3, 5, 7, 9, &c. and will be tranfmitted where the thicknefs is expreffed by any of the even numbers 2, 4, 6, 8, 10, &c.

Now as the plate is the fame in all parts, the caufe of this alternate reflection and tranfmiffion muft be in the rays themfelves; and their difpofitions to be thus alternately reflected and tranfmitted, are what we call fits of eafy reflection and eafy tranfmiffion.

The rays that are in a fit of eafy reflection penetrate as far as the fecond furface of the plate. For if the fecond furface of a thin plate of Mufcovy glafs is wetted, the colours caufed by the alternate reflection grow fainter; whereas if the reflection was made at the firft furface, wetting the fecond could not affect the colours. But fince thofe rays which have paffed from the firft furface of the plate to the fecond where the thicknefs of it is 1, are reflected, and thofe which have paffed from the firft furface to the fecond where the thicknefs of it is 2, are tranfmitted; and then again thofe which have thus paffed from one furface to the other, where the thicknefs is 3, are reflected; and thofe which have paffed in the fame manner, where the thicknefs is 4, are tranfmitted; it follows, that the fits of eafy reflection and tranfmiffion return at equal intervals. So that, if a ray was to fet out from A in the line AB, (No. 42.) and was to be in a fit of eafy reflection when it had moved from A to *c*, it would be in a fit of eafy tranfmiffion when it had moved to twice that diftance from A, or when it was got to *d*: at *e*, or the diftance 3 from A, it will be in a fit of eafy reflection; at *f*, or the diftance 4, in a fit of eafy tranfmiffion; at *g*, or 5, in a fit of eafy reflection; at B, or 6, in a fit of eafy tranfmiffion: and thus, in the farther progrefs of the ray, the fame fits will return at equal intervals.

Thus if the thicknefs of the plate of air, where the rays of any homogeneous colour are all reflected, is equal to A*c* or 1, and the rays are in a fit of eafy reflection when they come to the fecond furface of the plate; then, where the thicknefs of the plate is A*d* or 2, the rays will be in a fit of eafy tranfmiffion when they come to the fecond furface, and confequently will all pafs through that furface. Again, where the thicknefs is A*e* or 3, the rays, when they come to the fecond furface, will be in a fit of eafy reflection, and will all be reflected; where the thicknefs is A*f* or 4, the fit of eafy tranfmiffion will be returned when the rays come to the fecond furface, fo that all of them will be tranfmitted. And in like manner, by fuch fits returning at equal intervals, the rays will be reflected where the thicknefs is expreffed by the number 1, 3, 5, 7, 9, &c. and will be tranfmitted where it is expreffed by 2, 4, 6, 8, 10, &c.

When a thin coloured plate is viewed obliquely, the colours of every part in the plate will be altered.

When a bubble of water or a plate of air between two glaffes BAC, DAE, (No. 40.) is viewed obliquely, the coloured rings dilate themfelves: and confequently a ring of any one colour, by being dilated, gets into that part of the plate where a ring of fome other colour appeared when the plate was viewed directly.

If the plate is denfer than the medium that encompaffes it, the colours of it, when viewed obliquely, change lefs than they would if the plate was rarer than the medium that encompaffes it.

A bubble of water is a thin plate denfer than the air that encompaffes it: and a plate of air between the two glaffes BAC, DAE, (No. 48.) is rarer than the glafs that encompaffes it. Upon viewing each of thefe thin plates obliquely, the coloured rings on the plate of water dilate lefs than thofe on the plate of air. Therefore, fince it is by this dilation of the rings that a ring of

one

one colour gets into a part of the plate where a ring of ſome other colour appeared when the plate was viewed directly; that is, ſince it it by this dilatation of the rings that the ſeveral parts of the plates change their colours; it follows, that any part of a plate of water encompaſſed with air changes colour leſs upon being viewed obliquely, than any part of a plate of air encompaſſed with glaſs.

When the medium which encompaſſes a coloured tranſparent plate is given, the colours change leſs upon altering the ſituation of the eye, as the ſubſtance is more denſe out of which that plate is made.

The matter out of which a bubble of water is made is not ſo denſe as that out of which a bubble of glaſs is made, and glaſs is not ſo denſe as the ſcoria or glaſſy ſkin thrown out by metals when they are heated. Now, any of theſe plates either of water, or glaſs, or metalline ſubſtance, when they are encompaſſed with the ſame medium air, will change their colour a little upon being viewed obliquely; but the plate of water changes the moſt, the plate of glaſs leſs than that, and the ſcoria of metals leaſt of all.

Of the Opakeness, Transparency, *and* Colours *of* Natural Bodies.

The opakeneſs of bodies is owing to the many reflections and refractions which the rays of light ſuffer within thoſe bodies.

The ſmalleſt parts of almoſt all natural bodies are tranſparent, as will readily be granted by thoſe who have been uſed to look through microſcopes. A piece of leaf-gold is tranſparent if it is held up againſt the hole of a window-ſhutter in a dark room; and any other ſubſtance, however opake it may ſeem in the open air, will appear tranſparent by the ſame means, when it is made of a ſufficient thinneſs. Even metals become tranſparent, if they are diſſolved in a proper menſtruum, as gold in aqua regia, or ſilver in aqua fortis; and by being thus diſſolved, are reduced to very ſmall particles. But ſince even in opake bodies every ſingle particle tranſmits light, or is tranſparent, the whole would likewiſe tranſmit light, unleſs the rays, when they are to paſs through all the particles which make up the whole, were ſo turned out of the way by innumerable refractions and reflections, as to be ſtopped and ſuppreſſed in their paſſage. That this is the reaſon why bodies that conſiſt of tranſparent particles ſhould be opake, is evident; ſince opake bodies, when they are reduced to a ſufficient thinneſs, become tranſparent: for then there will be but few particles lying beyond one another for the light to paſs through; and as the rays will ſuffer fewer refractions and reflections, ſome of them may get through a thin plate, though all of them would be ſuppreſſed in a thicker maſs of the ſame ſubſtance.

The medium, with which the pores of opake bodies are filled, is not of the ſame denſity with the particles of thoſe bodies.

Bodies conſiſt of tranſparent particles, and their opakeneſs is owing to the many reflections and refractions which the light ſuffers within them. Now, if the interſtices between the particles of any body were filled with a medium of the ſame denſity with the particles, the light would neither be refracted nor reflected as it paſſed out of the particles into the interſtices and out of the interſtices into the pores, but would paſs through the body, and the body would be tranſparent. Conſequently, in an opake body, where the light is ſuppreſſed by the refractions and reflections which it ſuffers, the particles that compoſe the body, and the medium that fills the pores or interſtices between the particles, muſt be of different denſities.

Hence we may ſee the reaſon why paper, when it has been dipped in water or oil, is more tranſparent than when it is dry. For when the paper is thoroughly wetted with water or oil, the pores of it are filled with a medium that is nearly of the ſame denſity with its particles. On the contrary, though oil of turpentine and water are both of them tranſparent when they are ſeparate; yet if they are ſhaken together ſo as to mix but imperfectly, the mixture becomes much leſs tranſparent; becauſe the parts of each fluid are ſeparated from one another, and thoſe of the other fluid, which are of a different denſity, get in between them.

The parts of bodies, and their interſtices, muſt not be leſs than of a certain definite bigneſs to render them opake and coloured.

The moſt opake bodies become tranſparent when their particles are ſubtilly divided; as metals, ſuch as gold or ſilver, which are opake in large maſſes, become tranſparent when the former is diſſolved in aqua regia, and the latter in aqua fortis. And we obſerved, that at the top of a bubble of water, where the water is extremely thin, there is a black ſpot, which reflects ſcarce any light at all; though the water is encompaſſed with air, which is a medium of a different denſity. Conſequently, if the diameter of the particles of which any natural ſubſtance conſiſts was no greater than the thickneſs of the bubble, where it reflects no light, but tranſmits all, ſuch a body would be tranſparent, notwithſtanding the interſtices that are between its particles were filled with a medium the denſity of which is different from theirs.

In like manner, we obſerved, that when a thin plate of air lies between two pieces of glaſs BAC, DAE, (No 40.) there is a dark ſpot, which reflects no light, and tranſmits all, not only at the point A where the glaſſes touch one another, but alſo round that point to ſome diſtance where the glaſſes are very near to one another. From hence we may conclude, that though the particles of any natural ſubſtance were as denſe as glaſs, and the medium which fills their interſtices was as rare as air; yet if theſe interſtices were no bigger than the interval between the two glaſſes BAC, DAE, at that place where all light is tranſmitted, ſuch a body would be tranſparent.

The tranſparency of water ſeems to be owing to the cauſes here mentioned, to the ſmallneſs of its parts, or of its pores, or of both. For we are ſure that the pores of water are filled with air, becauſe the air may be drawn out from the water in an air-pump; and conſequently, as the pores are filled with a medium of a different denſity from the parts, the mixture ought to be opake, like ſuch a mixture of water and oil of turpentine as was mentioned above. But the ſmallneſs either of the parts, or

or of the interstices, or of both, will prevent the mixture from being opake.

Since therefore all bodies will be transparent, if either their parts or their interstices are too small, it follows that the parts, and likewise the pores, of such bodies as are not transparent but opake and coloured, must not be less than of a certain and determinate bigness.

The colours of natural bodies depend upon the size of their particles.

Different parts of thin transparent plates, according to the different thickness of them, are of different colours. Now if any part of such a thin plate of glass, for instance, where it appears of one uniform colour, should be split into threads, or broken into small particles, all these particles would make a heap of powder of the same colour. And the small particles of natural bodies, since they are transparent, like so many fragments of a thin plate, must exhibit colours in the same manner.

The parts of bodies, on which their colours depend, are much denser than the medium which fills their pores.

For where the transparent plate or particle consists of a rarer substance than the medium that encompasses it, the colours are less vivid than those of natural bodies commonly are. For this reason it is that the colours of silks or cloths, when they are wetted with oil or water, become more faint; because these liquors are more nearly of the same density with the particles, than the medium is which fills the interstices when they are dry. Besides, the colours upon a transparent plate change very sensibly, unless the plate consists of a substance much denser than the medium that encompasses it; but most natural bodies are of the same colour in whatever position of the eye they are viewed. Therefore their transparent particles, upon which their colours depend, are much denser than the medium which encompasses those particles or fills the interstices between them.

Nor is the case otherwise even in those bodies which do change colour upon being viewed obliquely, such as changeable silks, or the feathers of a peacock's tail or of a pigeon's neck. For this change of colour, upon the situation of the eye being changed, is no reason for concluding that the medium which fills the interstices or pores is more nearly of the same density with the particles, upon which the colours depend, in these bodies than in others; since the change of colour is plainly owing to our seeing a different part of the body in different positions of the eye. Thus, in changeable silks, the warp is of one colour, and the woof of another; and in one position of the eye more of the warp is seen, and in another position of it more of the woof is seen. In like manner, if a pigeon's neck appears blue in one position of the eye, and crimson in another, it is because in these different positions we see different parts of the same feathers.

We cannot from the colour of a body make any conjecture about the size of the particles upon which its colours depend.

Suppose, from the appearance of the colour in any yellow body, that we had determined its yellow to be of the same sort with that which is next to the black spot in a plate of air, or water, or glass. The thickness of a plate, where it appears of this colour, is different according to the different density of the substance out of which that plate is made; the thickness of a plate of air where it appears of this colour, is greater than that of a plate of water were it appears of the same colour, and much greater still than that of a plate of glass. Suppose therefore farther, that we were able to determine exactly what is the thickness of a plate of air or water or glass, where each of them is tinged with the same yellow colour that any natural body exhibits; yet we cannot determine whether the diameter of the particles, upon which this body's colour depends, is equal to the thickness of the plate of air, or of water, or of glass, unless we could first determine whether the density of those particles is equal to the density of air, or to that of water, or to that of glass: since the particles must be larger, if their density is equal to the density of air, than if it is equal to the density of water; and larger, if it is equal to that of water than if it is equal to that of glass. And indeed we have good reason to conclude, that the density of the parts, upon which the colours of natural bodies depend, is greater even than that of glass; and consequently that the diameter of those parts is much less than the thickness of a plate of glass, where it appears of the same colour with the body. For, upon being viewed obliquely, thin plates of glass change colour, whereas natural bodies do not: and the colour of natural bodies is made more unchangeable than that of thin plates of glass, by their particles being more dense than glass.

Of the Rainbow.

When the rays of the sun fall upon a drop of rain and enter into it, some of them, after one reflection and two refractions, may come to the eye of a spectator who has his back towards the sun and his face toward the drop.

If XY (No. 43.) is a drop of rain, and the sun shines upon it in any lines *sf, sd, sa*, &c. most of the rays will enter into the drop: some few of them only will be reflected from the first surface; those rays, which are reflected from thence, do not come under our present consideration, because they are never refracted at all. The greatest part of the rays then enter the drop, and those passing on to the second surface will most of them be transmitted through the drop; but neither do those rays which are thus transmitted fall under our present consideration, since they are not reflected. For the rays, which are described in the proposition, are such as are twice refracted and once reflected. However, at the second surface, or hinder part of the drop, at *pg* some few rays will be reflected, whilst the rays are transmitted: those rays proceed in some such lines as *nr,nq*; and coming out of the drop in the lines *rv, qt*, may fall upon the eye of a spectator, who is placed any where in those lines, with his face towards the drop, and consequently with his back towards the sun, which is supposed to shine upon the drop in the lines *sf,sd,sa*, &c. These rays are twice refracted, and once reflected: they are refracted, when they pass out of the air into the drop; they are reflected from the second surface, and are refracted again, when they pass out of the drop into the air.

When

When rays of light reflected from a drop of rain come to the eye, those are called effectual which are able to excite a sensation.

When rays of light come out of a drop of rain, they will not be effectual, unless they are parallel and contiguous.

There are but few rays that can come to the eye at all: for the greatest part of those rays which enter the drop *xy* (N° 43.) between *x* and *a*, pass out of the drop thro' the hinder surface *pg*; only few are reflected from thence and come out through the nearer surface between *a* and *y*. Now such rays as emerge, or come out of the drop, between *a* and *y*, will be ineffectual, unless they are parallel to one another, as *rv* and *qt* are; because such rays as come out diverging from one another, will be so far asunder when they come to the eye, that all of them cannot enter the pupil; and the very few that can enter it will not be sufficient to excite any sensation. But even rays, which are parallel, as *rv*,*qt*, will not be effectual, unless there are several of them contiguous or very near to one another. The two rays *rv* and *qt* alone will not be perceived, though both of them enter the eye; for so very few rays are not sufficient to excite a sensation.

When rays of light come out of a drop of rain after one reflection, those will be effectual which are reflected from the same point, and which entered the drop near to one another.

Any rays, as *sb* and *cd*, (No. 44.) when they have passed out of the air into a drop of water, will be refracted towards the perpendiculars *bl*, *dl*; and as the ray *sb* falls farther from the axis *av* than the ray *cd*, *sb* will be more refracted than *cd*; so that these rays, though parallel to one another at their incidence, may describe the lines *be* and *de* after refraction, and be both of them reflected from one and the same point *e*. Now all rays which are thus reflected from one and the same point, when they have described the lines *ef*, *eg*, and after reflection emerge at *f* and *g*, will be so refracted, when they pass out of the drop into the air, as to describe the lines *fh*, *gi*, parallel to one another. If these rays were to return from *e* in the lines *eb*, *ed*, and were to emerge at *b* and *d*, they would be refracted into the lines of their incidence *bs*, *dc*. But if these rays, instead of being returned in the lines *eb*, *ed*, are reflected from the same point *e* in the lines *eg*, *ef*, the lines of reflection *eg* and *ef* will be inclined both to one another and to the surface of the drop: just as much as the lines *eb* and *ed* are. First *eb* and *eg* make just the same angle with the surface of the drop: for the angle *bex*, which *eb* makes with the surface of the drop, is the complement of incidence; and the angle *gey*, which *eg* makes with the surface, is the complement of reflection; and these two are equal to one another. In the same manner we might prove that *ed* and *ef* make equal angles with the surface of the drop. Secondly, the angle *bed* is equal to the angle *feg*, or the reflected rays *eg*, *ef*, and the incident rays *be*, *de*, are equally inclined to each other. For the angle of incidence *bel* is equal to the angle of reflection *gel*, and the angle of incidence *del* is equal to the angle of reflection *fel*; consequently the difference between the angles of incidence is equal to the difference between the angles of reflection, or $bel—del=gel—fel$, or $bed=gef$. Since therefore either the lines *eg* *ef*, or the lines *eb* *ed*, are equally inclined both to one another and to the surface of the drop; the rays will be refracted in the same manner, whether they were to return in the lines *eb*, *ed*, or are reflected in the lines *eg*, *ef*. But if they were to return in the lines *eb*, *ed*, the refraction, when they emerge at *b* and *d*, would make them parallel. Therefore, if they are reflected from one and the same point *e* in the lines *eg*, *ef*, the refraction, when they emerge at *g* and *f*, will likewise make them parallel.

But though such rays, as are reflected from the same point in the hinder part of a drop of rain, are parallel to one another, when they emerge, and so have one condition that is requisite towards making them effectual; yet there is another condition necessary; for rays, that are effectual, must be contiguous, as well as parallel. And though rays, which enter the drop in different places, may be parallel when they emerge, those only will be contiguous which enter it nearly at the same place.

Let *xy*, (No. 43) be a drop of rain, *ag* the axis or diameter of the drop, and *sa* a ray of light that comes from the sun and enters the drop at the point *a*. This ray *sa*, because it is perpendicular to both the surfaces, will pass strait through the drop in the line *agh* without being refracted; but any collateral rays that fall about *sb*, as they pass through the drop, will be made to converge to their axis, and passing out at *n* will meet the axis at *h*: rays which fall farther from the axis than *sb*, such as those which fall about *sc*, will likewise be made to converge; but then their focus will be nearer to the drop than *h*. Suppose therefore *i* to be the focus to which the rays that fall about *sc* will converge, any ray *sc*, when it has described the line *co* within the drop, and is tending to the focus *i*, will pass out of the drop at the point *o*. The rays that fall upon the drop about *sd*, more remote still from the axis, will converge to a focus still nearer than *i*, as suppose at *k*. These rays therefore go out of the drop at *p*. The rays, that fall still more remote from the axis, as *se*, will converge to a focus nearer than *k*, as suppose at *l*; and the ray *se*, when it has described the line *eo* within the drop, and is tending to *l*, will pass out at the point *o*. The rays, that fall still more remote from the axis, will converge to a focus still nearer. Thus the ray *sf* will after refraction converge to a focus at *m*, which is nearer than *l*; and having described the line *fn* within the drop, it will pass out at the point *n*. Now here we may observe, that as any rays *sb* or *sc*, fall farther above the axis *sa*, the points *n*, or *o*, where they pass out behind the drop, will be farther above *g*; or that, as the incident ray rises from the axis *sa*, the arc *gno* increases, till we come to some ray *sd*, which passes out of the drop at *p*; and this is the highest point where any ray that falls upon the quadrant or quarter *ax* can pass out: for any rays *se*, or *sf*, that fall higher than *sd*, will not pass out in any point above *p*, but at the points *o*, or *n*, which are below it. Consequently, though the arc *gnop* increases, whilst the distance of the incident ray from the axis *sa* increased, till we come to the ray *sd*; yet afterwards, the higher the ray

ray falls above the axis *sa*, this arc *pong* will decrease.

We have hitherto spoken of the points on the hinder part of the drop, where the rays pass out of it; but this was for the sake of determining the points from whence those rays are reflected, which do not pass out behind the drop. For, in explaining the rain-bow, we have no farther reason to consider those rays which go through the drop; since they can never come to the eye of a spectator placed any where in the lines *rv* or *qt* with his face towards the drop. Now, as there are many rays which pass out of the drop between *g* and *p*, so some few rays will be reflected from thence; and consequently the several points between *g* and *p*, which are the points where some of the rays pass out of the drop, are likewise the points of reflection for the rest which do not pass out. Therefore, in respect of those rays which are reflected, we may call *gp* the arc of reflection; and may say, that this arc of reflection increases, as the distance of the incident ray from the axis *sa* increases, till we come to the ray *sd*; the arc of reflection is *gn* for the ray *sb*, it is *go* for the ray *sc*, and *gp* for the ray *sd*. But after this, as the distance of the incident ray from the axis *sa* increases, the arc of reflection decreases; for *og* less than *pg* is the arc of reflection for the ray *se*, and *ng* is the arc of reflection for the ray *sf*.

From hence it is obvious, that some one ray, which falls above *sd*, may be reflected from the same point with some other ray which falls below *sd*. Thus, for instance, the ray *sb* will be reflected from the point *n*, and the ray *sf* will be reflected from the same point; and consequently, when the reflected rays *nr*, *nq*, are refracted as they pass out of the drop at *r* and *q*, they will be parallel, by what has been shewn in the former part of this proposition. But since the intermediate rays, which enter the drop between *sf* and *sb*, are not reflected from the same point *n*, these two rays alone will be parallel to one another when they come out of the drop, and the intermediate rays will not be parallel to them. And consequently these rays *rv*, *qt*, though they are parallel after they emerge at *r* and *q*, will not be contiguous, and for that reason will not be effectual; the ray *sd* is reflected from *p*, which has been shewn to be the limit of the arc of reflection; such rays, as fall just above *sd*, and just below *sd*, will be reflected from nearly the same point *p*, as appears from what has been already shewn. These rays therefore will be parallel, because they are reflected from the same point *p*; and they will likewise be contiguous, because they all of them enter the drop at one and the same place very near to *d*. Consequently, such rays as enter the drop at *d*, and are reflected from *p* the limit of the arc of reflection, will be effectual; since, when they emerge at the fore part of the drop between *a* and *y*, they will be both parallel and contiguous.

If we can make out hereafter that the rain bow is produced by the rays of the sun which are thus reflected from drops of rain as they fall whilst the sun shines upon them, this proposition may serve to shew us, that this appearance is not produced by any rays that fall upon any part and are reflected from any part of those drops: since this appearance cannot be produced by any rays but those which are effectual; and effectual rays must always enter each drop at one certain place in the fore-part of it, and must likewise be reflected from one certain place in the hinder surface.

When rays that are effectual emerge from a drop of rain after one reflection and two refractions, those which are most refrangible will, at their emersion, make a less angle with the incident rays than those do which are least refrangible; and by this means the rays of different colours will be separated from one another,

Let *fh* and *gi*, (No. 44.) be effectual violet rays emerging from the drop at *fg*; and *fn*, *gp*, effectual red rays emerging from the same drop at the same place. Now, though all the violet rays are parallel to one another, because they are supposed effectual; and though all the red rays are likewise parallel to one another for the same reason; yet the violet rays will not be parallel to the red rays. These rays, as they have different colours, and different degrees of refrangibility, will diverge from one another; any violent ray *gi*, which emerges at *g*, will diverge from any red ray *gp*, which emerges at the same place. Now, both the violet ray *gi*, and the red ray *gp*, as they pass out of the drop of water into the air, will be refracted from the perpendicular *lo*. But the violet ray is more refrangible than the red one, and for that reason *gi*, or the refracted violet ray, will make a greater angle with the perpendicular than *gp* the refracted red ray; or the angle *igo* will be greater than the angle *pgo*. Suppose the incident ray *sb* to be continued in the direction *sk*, and the violet ray *ig* to be continued backward in the direction *ik*, till it meets the incident ray at *k*. Suppose likewise the red ray *pg* to be continued backwards in the same manner, till it meets the incident ray at *w*. The angle *ikk* is that which the violet ray, or most refrangible ray at its emersion, makes with the incident ray; and the angle *pws* is that which the red ray, or least refrangible ray at its emersion, makes with the incident ray. The angle *iks* is less than the angle *pws*. For, in the triangle *gwk*, *gws* or *pws* is the external angle at the base, and *gkw* or *iks* is one of the internal opposite angles; and either internal opposite angle is less than the external angle at the base. Euc. b. I. prop. 16. What has been shewn to be true of the rays *gi* and *gp* might be shewn in the same manner of the rays *fh* and *fn*, or of any other rays that emerge respectively parallel to *gi* and *gp*: But all the effectual violet rays are parall to *gi*, and all the effectual red rays are parallel to *gp*. Therefore the effectual violet rays at their emersion make a less angle with the incident ones than the effectual red ones. And for the same reason, in all the other sorts of rays, those which are most refrangible, at their emersion from a drop of rain after one reflection, will make a less angle with the incident rays, than those do which are less refrangible.

Or otherwise: When the rays *gi* and *gp* emerge at the same point *g*, as they both come out of water into air, and consequently are refracted from a perpendicular, instead of going straight forwards in the line *eg* continued, they will both be turned round upon the point *g* from the perpendicular *go*. Now it is easy to conceive, that either of these lines might be turned in this manner upon the point

g as

g as upon a centre, till they became parallel to *sb* the incident ray. But if either of these lines or rays were refracted so much from *go* as to become parallel to *sb*, the ray so much refracted would, after emersion, make no angle with *sk*, because it would be parallel to it. And consequently that ray which is most turned round upon the point *g*, or that ray which is most refrangible, will after emersion be nearest parallel to the incident ray, or will make the least angle with it. The same may be proved of all other rays emerging parallel to *gi* and *gp* respectively, or of all effectual rays; those, which are most refrangible, will after emersion make a less angle with the incident rays, than those do which are least refrangible.

But since the effectual rays of different colours make different angles with *sk* at their emersion, they will be separated from one another: so that if the eye was placed in the beam *fghi*, it would receive only rays of one colour from the drop *xagy*; and if it was placed in the beam *fgnp*, it would receive only rays of some other colour.

The angle *swp*, which the least refrangible or red rays make with the incident ones, when they emerge so as to be effectual, is found by calculation to be 42 degrees 2 minutes. And the angle *ski*, which the most refrangible rays make with the incident ones, when they emerge so as to be effectual, is found to be 40 degrees 17 minutes. The rays, which have the intermediate degrees of refrangibility, make with the incident ones intermediate angles between 42 degrees 2 minutes and 40 degrees 17 minutes.

If a line is supposed to be drawn from the centre of the sun through the eye of the spectator, the angle which any effectual ray, after two refractions and one reflection, makes with the incident ray, will be equal to the angle which it makes with that line.

Let the eye of the spectator be at *i*, (No. 44.) and let *qt* be the line supposed to be drawn from the centre of the sun through the eye of the spectator; the angle *git*, which any effectual ray makes with this line, will be equal to the angle *iks*, which the same ray makes with the incident ray *sb* or *sk*. If *sb* is a ray coming from the centre of the sun, then since *qt* is supposed to be drawn from the same point, these two lines, upon account of the remoteness of the point from whence they are drawn, may be looked upon as parallel to one another. But the right line *ki* crossing these two parallel lines will make the alternate angles equal. Euc. b. I. prop. 29. Therefore *kit* or *git* is equal to *ski*.

When the sun shines upon the drops of rain as they are falling; the rays that come from those drops to the eye of a spectator, after one reflection and two refractions, produce the primary rainbow.

If the sun shines upon the rain as it falls, there are commonly seen two bows, as AFB, CHD, (No. 46.) or if the cloud and rain does not reach over that whole side of the sky where the bows appear, then only a part of one or of both bows is seen in that place where the rain falls. Of these two bows, the innermost AFB is the more vivid of the two, and this is called the primary bow. The outer part TFY of the primary bow is red, the inner part VEX is violet; the intermediate parts, reckoning from the red to the violet, are orange, yellow, green, blue, and indigo. Suppose the spectator's eye to be at O, and let LOP be an imaginary line drawn from the centre of the sun through the eye of the spectator: If a beam of light S coming from the sun falls upon any drop F; and the rays that emerge at F in the line FO, so as to be effectual, make an angle FOP of 42 degrees 2 minutes with the line LP; then these effectual rays make an angle of 42 degrees 2 minutes with the incident rays, by the preceding proposition, and consequently these rays will be red, so that the drop F will appear red. All the other rays, which emerge at F, and would be effectual if they fell upon the eye, are refracted more than the red ones, and consequently will pass above the eye. If a beam of light S falls upon the drop E; and the rays that emerge at *E* in the line EO, so as to be effectual, make an angle EOP of 40 degrees 17 minutes with the line LP; then these effectual rays make likewise an angle of 40 degrees 17 minutes with the incident rays, and the drop E will appear of a violet colour. All the other rays, which emerge at E, and would be effectual if they came to the eye, are refracted less than the violet ones, and therefore pass below the eye. The intermediate drops between F and E will for the same reasons be of the intermediate colours.

Thus we have shewn why a set of drops from F to E, as they are falling, should appear of the primary colours, red, orange, yellow, green, blue, indigo, and violet. It is not necessary that the several drops, which produce these colours, should all of them fall at exactly the same distance from the eye. The angle FOP, for instance, is the same whether the distance of the drop from the eye is OF, or whether it is in any other part of the line OF something nearer to the eye. And whilst the angle FOP is the same, the angle made by the emerging and incident rays, and consequently the colour of the drop, will be the same. This is equally true of any other drop. So that although in the figure the drops F and E are represented as falling perpendicularly one under the other, yet this is not necessary in order to produce the bow.

But the coloured line FE, which we have already accounted for, is only the breadth of the bow. It still remains to be shewn, why not only the drop F should appear red, but why all the other drops quite from A to B in the arc ATFYB should appear of the same colour. Now it is evident, that where-ever a drop of rain is placed, if the angle, which the effectual rays make with the line LP is equal to the angle FOP, that is, if the angle which the effectual rays make with the incident rays is 42 degrees 2 minutes, any of those drops will be red, for the same reason that the drop F is of this colour.

If FOP was to turn round upon the line OP, so that one end of this line should always be at the eye, and the other be at P opposite to the sun; such a motion of this figure would be like that of a pair of compasses turning round upon one of the legs OP with the opening FOP. In this revolution the drop F would describe a circle, P would be the centre, and ATFYB would be an arc in this circle. Now since, in this motion of the line and drop OF, the angle made by FO with OP, that is, the angle FOP, continues the same; if the sun was to shine upon this drop as it revolves, the effectual rays would make the same angle

angle with the incident rays, in whatever part of the arc ATFYB the drop was to be. Therefore, whether the drop is at A, or at T, or at Y, or at B, or where-ever elſe it is in this whole arc, it would appear red, as it does at F. The drops of rain, as they fall, are not indeed turned round in this manner: but then, as innumerable of them are falling at once in right lines from the cloud, whilſt one drop is at F, there will be others at Y, at T, at B, at A, and in every other part of the arc ATFYB: and all theſe drops will be red for the ſame reaſon that the drop F would have been red, if it had been in the ſame place. Therefore, when the ſun ſhines upon the rain as it falls, there will be a red arc ATFYB oppoſite to the ſun. In the ſame manner, becauſe the drop E is violet, we might prove that any other drop, which, whilſt it is falling, is in any part of the arc AVEXB, will be violet, and conſequently, at the ſame time that the red arc ATFYB appears, there will likewiſe be a violet arc AVEXB below or within it. FE is the diſtance between theſe two coloured arcs; and from what has been ſaid it follows, that the intermediate ſpace between theſe two arcs will be filled up with arcs of the intermediate colours, orange, yellow, blue, green, and indigo. All theſe coloured arcs together make up the primary rainbow.

The primary rainbow is never a greater arc than a ſemicircle.

Since the line LOP is drawn from the ſun through the eye of the ſpectator, and ſince P (No. 46.) is the centre of the rainbow; it follows, that the centre of the rainbow is always oppoſite to the ſun. The angle FOP is an angle of 42 degrees 2 minutes, as was obſerved, or F the higheſt part of the bow is 42 degrees 2 minutes from P the centre of it. If the ſun is more than 42 degrees 2 minutes high, P the centre of the rainbow, which is oppoſite to the ſun, will be more than 42 degrees 2 minutes below the horizon; and conſequently F the top of the bow, which is only 42 degrees 2 minutes from P, will be below the horizon; that is, when the ſun is more than 42 degrees 2 minutes high, no primary rainbow will be ſeen. If the ſun is ſomething leſs than 42 degrees 2 minutes high, then P will be ſomething leſs than 42 degrees 2 minutes below the horizon; and conſequently F, which is only 42 degrees 2 minutes from P, will be juſt above the horizon; that is, a ſmall part of the bow at this height of the ſun will appear cloſe to the ground oppoſite to the ſun. If the ſun is 20 degrees high, then P will be 20 degrees below the horizon; and F the top of the bow, being 42 degrees 2 minutes from P, will be 22 degrees 2 minutes above the horizon; therefore, at this height of the ſun, the bow will be an arc of a circle whoſe centre is below the horizon; and conſequently that arc of the circle, which is above the horizon, or the bow, will be leſs than a ſemicircle. If the ſun is in the horizon, then P, the centre of the bow, will be in the oppoſite part of the horizon; F, the top of the bow, will be 42 degrees 2 minutes above the horizon; and the bow itſelf, becauſe the horizon paſſes thro' the centre of it, will be a ſemicircle. More than a ſemicircle can never appear; becauſe if the bow was more than ſemicircle, P the centre of it muſt be above the horizon; but P is always oppoſite to the ſun, therefore P cannot be above the horizon, unleſs the ſun is below it; and when the ſun is ſet, or is below the horizon, it cannot ſhine upon the drops of rain, as they fall; and conſequently, when the ſun is below the horizon no bow at all can be ſeen.

When the rays of the ſun fall upon a drop of rain, ſome of them, after two reflections and two refractions, may come to the eye of a ſpectator, who has his back towards the ſun and his face towards the drop.

If *hgw*, (No. 45.) is a drop of rain, and parallel rays coming from the ſun, as *zv*, *yw*, fall upon the lower part of it, they will be refracted towards the perpendiculars *vl*, *wl*, as they enter into it, and will deſcribe ſome ſuch lines as *vh*, *wi*. At *h* and *i* great part of theſe rays will paſs out of the drop; but ſome of them will be reflected from thence in the lines *hf*, *ig*. At *f* and *g* again, great part of the rays, that were reflected thither, will paſs out of the drop. But theſe rays will not come to the eye of a ſpectator at *o*. However, here again all the rays will not paſs out; but ſome few will be reflected from *f* and *g*, in ſome ſuch lines as *fd*, *gb*; and theſe, when they emerge out of the drop of water into the air at *b* and *d*, will be refracted from the perpendiculars, and, deſcribing the lines *dt*, *bo*, may come to the eye of a ſpectator who has his back towards the ſun and his face towards the drop.

Thoſe rays, which are parallel to one another after they have been once refracted and once reflected in a drop of rain, will be effectual when they emerge after two refractions and two reflections.

No rays can be effectual, unleſs they are contiguous, and parallel. From what was ſaid, it appears, that when rays come out of a drop of rain contiguous to one another, either after one or after two reflections, they muſt enter the drop nearly at one and the ſame place. And if ſuch rays as are contiguous are parallel after the firſt reflection, they will emerge parallel, and therefore will be effectual. Let *zv* and *yw* be contiguous rays which come from the ſun, and are parallel to one another when they fall upon the lower part of the drop *bgw*, (No. 45.) ſuppoſe theſe rays to be refracted at *v* and *w*, and to be reflected at *h* and *i*; if they are parallel to one another, as *hf*, *gi*, after this firſt reflection, then, after they are reflected a ſecond time from *f* and *g*, and refracted a ſecond time as they emerge at *d* and *b*, they will go out of the drop parallel to one another in the lines *dt* and *bo*, and will therefore be effectual.

The rays *zv*, *yw*, are refracted towards the perpendiculars *vl*, *wl*, when they enter the drop, and will be made to converge. As theſe rays are very oblique, their focus will not be far from the ſurface *vw*. If this focus is at *k*, the rays, after they have paſſed the focus, will diverge from thence in the directions *kh*, *ki*; and if *ki* is the principal focal diſtance of the concave reflecting ſurface *hi*, the reflected rays *hf*, *ig*, will be parallel. Theſe rays *hf*, *ig*, are reflected again from the concave ſurface *fg*, and will meet in a focus at *e*, ſo that *ge* will be the principal focal diſtance of this reflecting ſurface *fg*. And becauſe *hi* and *fg* are parts of the ſame ſphere, the principal focal diſtances *ge* and *ki* will be equal to one another. When the rays have paſſed the focus *e*, they will diverge from thence in the lines *ed*, *eb*: and we are to ſhew, that, when they emerge at *d* and *b*, and are refracted there, they will become parallel.

Now if the rays *vk*, *wk*, when they have met at *k*, were to be turned back again in the directions *kv*, *kw*, and were to emerge at *v* and *w*, they would be refracted into the lines of their incidence *vz*, *wy*, and therefore would be parallel. But ſince *ge* is equal to *ik*, as has already been ſhewn, the rays

rays *ed*, *eb*, that diverge from *e*, fall in the fame manner upon the drop at *d* and *b*, as the rays *kv*, *kw*, would fall upon it at *v* and *w*; and *ed*, *eb*, are juft as muft inclined to the refracting furface *db*, as *kv*, *kw*, would be to the furface *vw*. From hence it follows, that the rays *ed*, *eb*, emerging at *d* and *b*, will be refracted in the fame manner, and will have the fame direction in refpect of one another, as *kv*, *kw*, would have. But *kv* and *kw* would be parallel after refraction. Therefore *ed* and *eb* will emerge in lines *dp*, *bo*, fo as to be parallel to one another, and confequently fo as to be effectual.

When rays that are effectual emerge from a drop of rain after two reflections and two refractions, thofe which are moft refrangible will at their emerfion make a greater angle with the incident rays than thefe do which are leaft refrangible; and by this means the rays of different colours will be feparated from one another.

If rays of different colours, which are differently refrangible, emerge at any point *b*, (No. 45.) thefe rays will not be all of them equally refracted from the perpendicular. Thus, if *bo* is a red ray, which is of all others the leaft refrangible, and *bm* is a violet ray, which is of all others the moft refrangible; when thefe two rays emerge at *b*, the violet ray will be refracted more from the perpendicular *bx* than the red ray, and the refracted angle *xbm* will be greater than the refracted angle *xbo*. From hence it follows, that thefe two rays, after emerfion, will diverge from one another. In like manner, the rays that emerge at *d* will diverge from one another; a red ray will emerge in the line *dp*, a violet ray in the line *dt*. So that though all the effectual red rays of the beam *bdmt* are parallel to one another, and all the effectual red rays of the beam *bdop* are likewife parallel to one another, yet the violet rays will not be parallel to the red ones, but the violet beam will diverge from the red beam. Thus the rays of different colours will be feparated from one another.

This will appear farther, if we confider what the propofition affirms, That any violet or moft refrangible ray will make a greater angle with the incident rays, than any red or leaft refrangible ray makes with the fame incident rays. Thus if *yw* is an incident ray, *bm* a violet ray emerging from the point *b*, and *bo* a red ray emerging from the fame point; the angle which the violet ray makes with the incident one is *yrm*, and that which the red ray makes with it is *yso*. Now *yrm* is a greater angle than *yso*. For in the triangle *brs* the internal angle *brs* is lefs than *bsy* the external angle at the bafe. Euc. b. I. prop. 16. But *yrm* is the complement of *brs* or of *bry* to two right ones, and *yso* is the complement of *bsy* to two right ones. Therefore, fince *bry* is lefs than *bsy*, the complement of *bry* to two right angles will be greater than the complementy of *bsy* to two right angles; or *yrm* will be greater than *yso*.

Or otherwife: Both the rays *bo* and *bm*, when they are refracted in paffing out of the drop at *b*, are turned round upon the point *b* from the perpendicular *bx*. Now either of thefe lines *bo* or *bm* might be turned round in this manner, till it made a right angle with *yw*. Confequently, that ray which is moft turned round upon *b*, or which is moft refracted, will make an angle with *yw* that will be nearer to a right one than that ray makes with it which is leaft turned round upon *b*, or which is leaft refracted. Therefore that ray which is moft refracted will make a greater angle with the incident ray than that which is leaft refracted.

But fince the emerging rays, as they are differently refrangible, make different angles with the fame incident ray *yw*, the refraction which they fuffer at emerfion will feparate them from one another.

The angle *yrm*, which the moft refrangible or violet rays make with the incident ones, is found by calculation to be 54 degrees 7 minutes; and the angle *yso*, which the leaft refrangible or red rays make with the incident ones, is found to be 50 degrees 57 minutes: the angles, which the rays of the intermediate colours, indigo, blue, green, yellow, and orange, make with the incident rays, are intermediate angles between 54 degrees 7 minutes and 50 degrees 57 minutes.

If a line is fuppofed to be drawn from the centre of the fun through the eye of the fpectator; the angle, which, after two refractions and two reflections, any effectual ray makes with the incident ray, will be equal to the angle which it makes with that line.

If *yw*, (No 45.) is an incident ray, *bo* an effectual ray, and *qn* a line drawn from the centre of the fun through *o* the eye of the fpectator; the angle *yso*, which the effectual ray makes with the incident ray, is equal to *son* the angle which the fame effectual ray makes with the line *qn*. For *yw* and *qn*, confidered as drawn from the centre of the fun, are parallel; *bo* croffes them, and confequently makes the alternate angles *yso*, *son*, equal to one another. Euc. b. I. prop. 29.

When the fun fhines upon the drops of rain as they are falling; the rays that come from thofe drops to the eye of a fpectator, after two reflections and two refractions, produce the fecondary rainbow.

The fecondary rainbow is the outermoft CHD, No. 46. When the fun fhines upon a drop of rain H; and the rays HO, which emerge at H fo as to be effectual, make an angle HOP of 54 degrees 7 minutes with LOP a line drawn from the fun through the eye of the fpectator; the fame effectual rays will make likewife an angle of 54 degrees 7 minutes with the incident rays S, and the rays which emerge at this angle are violet ones, by what was obferved above. Therefore, if the fpectator's eye is at O, none but violet rays will enter it: for as all the other rays make a lefs angle with OP, they will fall above the fpectator's eye. In like manner, if the effectual rays that emerge from the drop G make an angle of 50 degrees 57 minutes with the line OP, they will likewife make the fame angle with the incident rays S; and confequently, from the drop G to the fpectator's eye at O, no rays will come but red ones; for all the other rays, making a greater angle with the line OP, will fall below the eye at O. For the fame reafon, the rays emerging from the intermediate drops between H and G, and coming to the fpectator's eye at O, will emerge at intermediate angles, and therefore will have the intermediate colours. Thus, if there are feven drops from H to G inclufively, their colours will be violet, indigo, blue, green, yellow, orange and red. This coloured line is the breadth of the fecondary rainbow,

Now, if HOP was to turn round upon the line OP, like a pair of compaffes upon one of the legs OP with the opening HOP, it is plain from the fuppofition, that, in fuch a revolution of the drop H, the angle HOP would be the fame,

ſame, and conſequently the emerging rays would make the ſame angle with the incident ones. But in ſuch a revolution the drop would deſcribe a circle of which P would be the centre and CNHRD an arc. Conſequently, ſince, when the drop is at N, or at R, or any where elſe in that arc, the emerging rays make the ſame angle with the incident ones as when the drop is at H, the colour of the drop will be the ſame to an eye placed at O, whether the drop is at N, or at H, or at R, or any where elſe in that arc. Now, though the drop does not thus turn round as it falls, and does not paſs through the ſeveral parts of this arc, yet, ſince there are drops of rain falling every where at the ſame time, when one drop is at H, there will be another at R, another at N, and others in all parts of the arc; and theſe drops will all of them be violet-coloured, for the ſame reaſon that the drop H would have been of this colour if it had been in any of thoſe places. In like manner, as the drop G is red when it is at G, it would likewiſe be red in any part of the arc CWGQD; and ſo will any other drop, when, as it is falling, it comes to any part of that arc. Thus as the ſun ſhines upon the rain, whilſt it falls, there will be two arcs produced, a violet coloured one CNHRD, and a red one CWGQD; and for the ſame reaſons the intermediate ſpace between theſe two arcs will be filled up with arcs of the intermediate colours. All theſe arcs together make up the ſecondary rainbow.

The colours of the ſecondary rainbow are fainter than thoſe of the primary rainbow; and are ranged in the contrary order.

The primary rainbow is produced by ſuch rays as have been only once reflected; the ſecondary rainbow is produced by ſuch rays as have been twice reflected. But at every reflection ſome rays paſs out of the drop of rain without being reflected; ſo that the oftener the rays are reflected, the fewer of them are left. Therefore the colours of the ſecondary bow are produced by fewer rays, and conſequently will be fainter, than the colours of the primary bow.

In the primary bow, reckoning from the outſide of it, the colours are ranged in this order; red, orange, yellow, green, blue, indigo, violet. In the ſecondary bow, reckonign from the outſide, the colours are violet, indigo, blue, green yellow, orange, red. So that the red, which is the outermoſt or higheſt colour in the primary bow, is the innermoſt or loweſt colour in the ſecondary one.

Now the violet rays, when they emerge ſo as to be effectual after one reflection, make a leſs angle with the incident rays than the red ones; conſequently the violet rays make a leſs angle with the lines OP, (No. 46.) than the red ones. But in the primary rainbow the rays are only once reflected, and the angle which the effectual rays make with OP is the diſtance of the coloured drop from P the centre of the bow. Therefore the violet drops or violet arc in the primary bow will be nearer to the centre of the bow, than the red drops or red arc; that is, the innermoſt colour in the primary bow will be violet, and the outermoſt colour will be red. And, for the ſame reaſon, through the whole primary bow, every colour will be nearer to the centre P, as the rays of that colour are more refrangible.

But the violet rays, when they emerge ſo as to be effectual after two reflections, make a greater angle with the incident rays than the red ones; conſequently the violet rays will make a greater angle with the line OP, than the red ones. But in the ſecondary rainbow the rays are twice reflected, and the angle which effectual rays make with OP is the diſtance of the coloured drop from P the centre of the bow. Therefore the violet drops or violet arc in the ſecondary bow will be farther from the centre of the bow than the red drops or red arc; that is, the outermoſt colour in the ſecondary bow will be violet. and the innermoſt colour will be red. And, for the ſame reaſon, thro' the whole ſecondary bow, every colour will be further from the centre P, as the rays of that colour are more refrangible.

OPTIMATES, in Roman antiquity, were, according to Tully, the beſt citizens, who deſired their actions might be approved of by the better ſort; and the populares, thoſe who, out of a thirſt of vain-glory, did not conſider ſo much what was right, as what would pleaſe the populace.

OPUNTIA, in botany. See Cactus.

OR, in heraldry, denotes yellow, or gold colour. See Colour and Metal.

In the coats of noblemen, it is blazoned topaz; and in thoſe of ſovereign princes, ſol.

It is repreſented in engraving by ſmall points or dots, ſcattered all over the field or bearing. See Pl. 134. fig. 5.

ORACLE, among the heathens, was the anſwer which the gods were ſuppoſed to give to thoſe who conſulted them upon any affair of importance; it is alſo uſed for the god who it was thought gave the anſwer, and the place where it was given.

The credit of oracles was ſo great, that in all doubts and diſputes their determinations were held ſacred and inviolable: whence vaſt numbers flocked to them for advice about the management of their affairs; and no buſineſs of any conſequence was undertaken, ſcarce any peace concluded, any war waged, or any new form of government inſtituted, without the advice and approbation of ſome oracle. The anſwers were uſually given by the intervention of the prieſt or prieſteſs of the god who was conſulted; and generally expreſſed in ſuch dark and intermediate phraſes, as might be eaſily wreſted to prove the truth of the oracle whatever was the event. It is not, therefore, to be wondered at, that the prieſts who delivered them were in the higheſt credit and eſteem; and that they improved this reputation greatly to their advantage. They accordingly allowed no man to conſult the gods, before he had offered coſtly ſacrifices, and made rich preſents to them. And to keep up the veneration for their oracles, and to prevent their being taken unprepared, they admitted perſons to conſult the gods only at certain ſtated times; and ſometimes they were ſo cautious, that the greateſt perſons could obtain no anſwer at all. Thus Alexander himſelf was peremptorily denied by the pythia, or prieſteſs of Apollo, till ſhe was, by downright force, obliged to aſcend the tripos; when, being unable to reſiſt any longer, ſhe cried out, *thou art invincible*; and theſe words were accepted inſtead of a farther oracle. See Mythology.

ORACH, in botany. See Atriplex.

ORAL, ſomething delivered by word of mouth, without being committed to writing; in which ſenſe we ſay, oral law, oral tradition, *&c.*

ORANGE-tree, in botany. See Citrus.

Orange, in geography, a city of Provence, in France, capital of the principality of Orange: it is ſituated on the eaſt ſide of the river Rhone, ſeventeen miles north of Avignon: E. long. 4° 46′, N. lat. 44° 10′.

ORATION, in rhetoric, a ſpeech or harangue, compoſed according to the rules of oratory, and ſpoken in public.

Orations may be all reduced to three kinds, *viz.* the demonſtrative, deliberative, and judicial. To the demonſtrative kind belong panegyrics, genethliaca, epithalamia, congratulations, *&c.* To the deliberative kind belong perſuaſion, exhortation, *&c.* And to the judicial kind belong accuſation, confutation, *&c.*

ORATORIO, in the Italian muſick, a ſort of ſacred drama of dialogues; containing recitativos, duettos, trios, ritornellos, choruſes, *&c.*

The ſubjects of theſe pieces are uſually taken from the ſcriptures, or from the life of ſome ſaint, *&c.*

The muſick for the oratorio ſhould be in the fineſt taſte, and beſt choſen ſtrains. Theſe oratorios are greatly uſed at Rome, in time of lent; and of late, in England.

ORATORY. See Rhetoric.

Oratory, among the Romaniſts, a cloſet or like apartment near a bed-chamber, furniſhed with an altar, crucifix, *&c.* for private devotion.

ORB, in aſtronomy, *&c.* denotes an hollow globe or ſphere.

ORBICULARIS, in anatomy. See Anatomy, p. 306.

ORBIS, in ichthyology, a name given to two ſpecies of oſtracion, nearly as broad as long, and covered with ſpines. See Ostracion.

Orbis magnus, in aſtronomy, denotes the earth's orbit, in its annual revolution round the ſun.

ORBIT, in aſtronomy, the path of a planet or comet, or the curve that it deſcribes in its revolution round its central body: thus the earth's orbit is the curve which it deſcribes in its annual courſe, and uſually called the ecliptic. See Astronomy.

ORCADES, the Orkney-islands. See Orkney.

ORCHARD, a plantation of fruit-trees. See Gardening.

ORCHESTRA, in the ancient theatres, a place in the form of a ſemi-circle, where the dancing was performed.

In the Greek theatres, the orcheſtra made part of the ſtage; but, among the Romans, it anſwered nearly to our pit; only that in it were diſpoſed the ſeats for the ſenators, magiſtrates, veſtals, and other perſons of diſtinction.

ORCHIS, in botany, a genus of the gynandria diandria claſs. The nectarium is ſhaped like a horn behind the flower. There are 32 ſpecies, 12 of them natives of Britain. The root of the morio, or female fool-ſtones, has been celebrated as an aphrodiſiac, but without any ſolid foundation.

ORDEAL, a form of trial, or of diſcovering innocence or guilt, formerly practiſed over almoſt all Europe, and which prevailed in England from the time of Edward the Confeſſor, till it was aboliſhed by a declaration of Henry III. It was called purgatio vulgaris, or judicium; in oppoſition to bellum or combat, the other form of purgation; and was of various kinds, as that of fire, that of red hot-iron, that of water, that of judicial pottage, that of hallowed cheeſe, that of the green croſs, and that of dice laid on relics covered with a woollen cloth. To each of which kinds particular maſſes were appointed.

In England, an offender, on being arraigned and pleading not guilty, had it in his choice to put himſelf upon God and his country; that is, upon the verdict of a jury; or upon God alone, on which account it was called the judgment of God, it being preſumed that God would deliver the innocent. The more popular kinds of ordeal were thoſe of red-hot iron and water; the firſt for freemen and people of faſhion, and the laſt for peaſants. That by fire, as practiſed here, was the perſon's walking bare-footed and blindfold over nine red-hot ploughſhares; and if he eſcaped unhurt, he was acquitted; otherwiſe, condemned. That of water was of two kinds, *viz.* either with hot water, or cold: the former was where the perſon ſuſpected put his arm or leg into ſcalding water, and brought it out unhurt; and the latter was when his body was not, contrary to the courſe of nature, borne up by the water.

ORDER, in architecture, is a ſyſtem of the ſeveral members, ornaments, and proportions of columns and pilaſters; or a regular arrangement of the projecting parts of a building, eſpecially the column, ſo as to form one beautiful whole. See Architecture.

Order is alſo uſed for a diviſion or claſs of any thing: thus, the tribe of animals called birds is ſubdivided into ſix orders. See Natural History, and Botany.

Holy orders, a character peculiar to eccleſiaſtics, whereby they are ſet apart for the miniſtry. See Ordination.

Military orders, are companies of knights, inſtituted by kings and princes; either for defence of the faith, or to confer marks of honour, and make diſtinctions among their ſubjects.

Religious orders, are congregations or ſocieties of monaſtics, living under the ſame ſuperior, in the ſame manner, and wearing the ſame habit

ORDINAL, a book containing the order or manner of performing divine ſervice.

ORDINANCE, or Ordonnance, a law, ſtatute, or command of a ſovereign or ſuperior: thus the acts of parliament are ſometimes termed ordinances of parliament.

Ordinary, in civil law, is any judge inveſted with authority to take cognizance of cauſes in his own right, and not by deputation

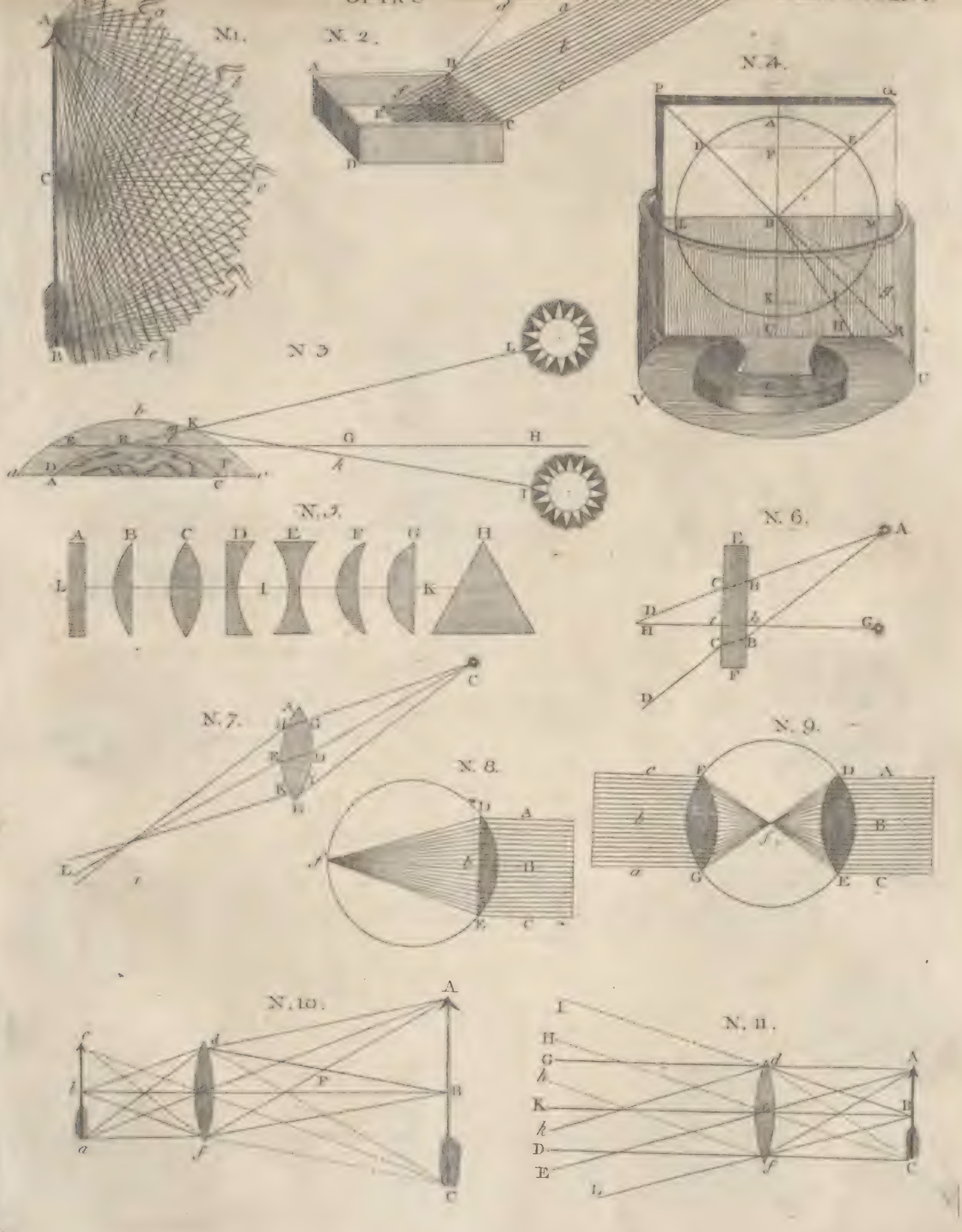
Ordinary, or *honourable* Ordinary, in heraldry, a denomination given to certain charges properly belonging to that art. The honourable ordinaries are ten in number; *viz.* the chief, pale, bend, feſſe, bar, croſs, ſaltier, chevron, bordure, and orle. For which ſee the articles Chief, Pale, *&c.*

ORDINATES. See Conic Sections.

ORDINATION, the act of conferring holy orders, or of initiating a perſon into the prieſthood by prayer and the laying on of hands.

ORDNANCE, a general name for all ſorts of great guns uſed in war. See Gunnery.

Office of Ordnance, an office kept within the tower of London, which ſuperintends and diſpoſes of all the arms, inſtruments, and utenſils of war, both by ſea and land, in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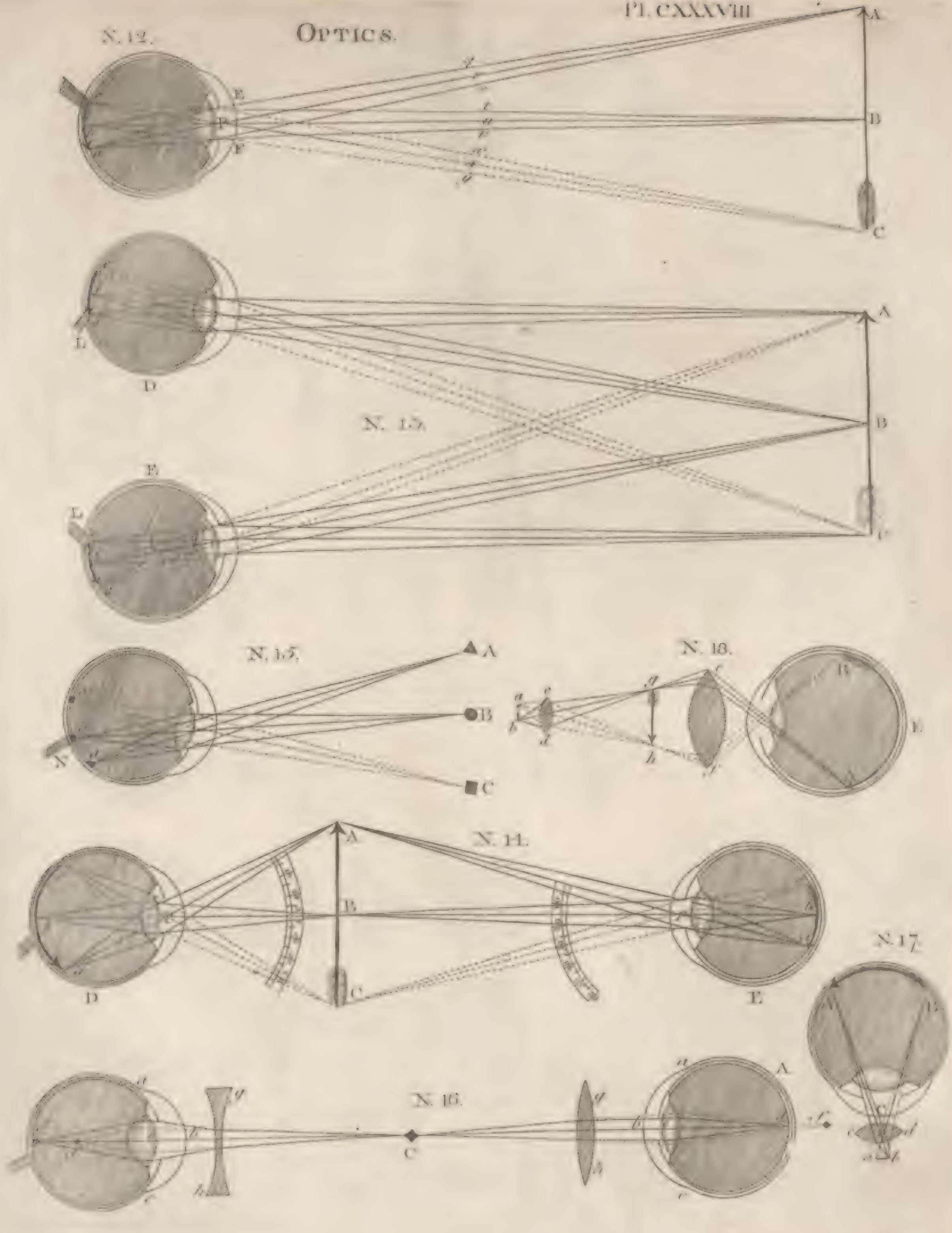
OPTICS.

Pl. CXXXVIII



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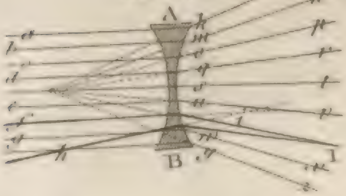

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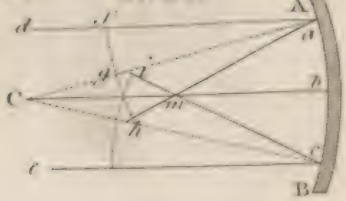

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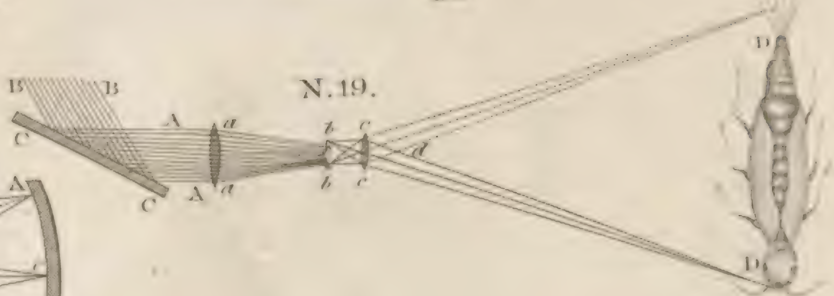

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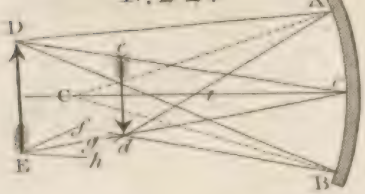

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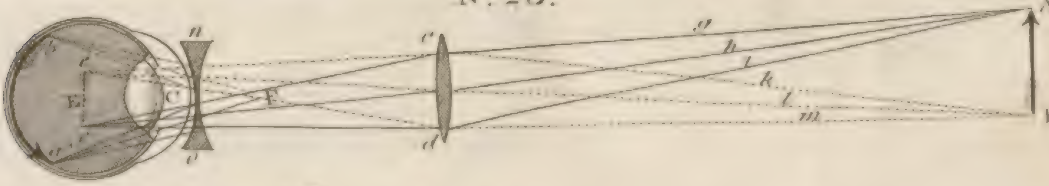

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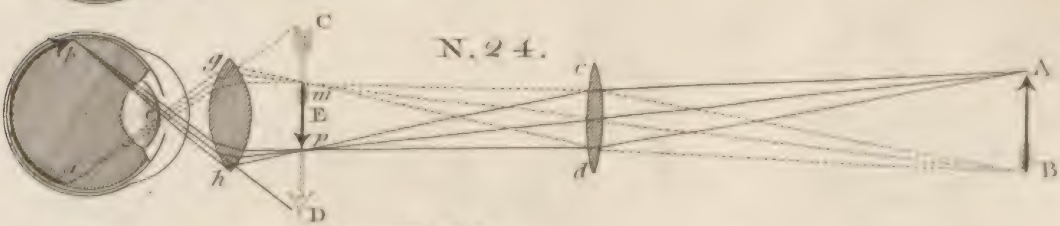

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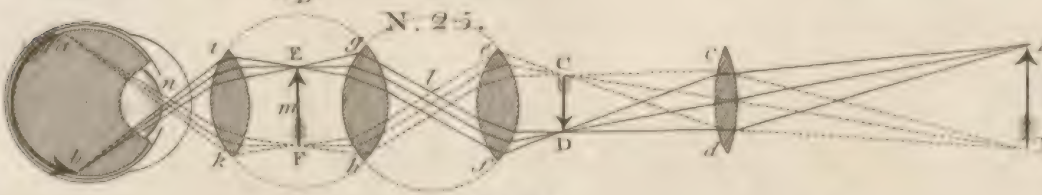

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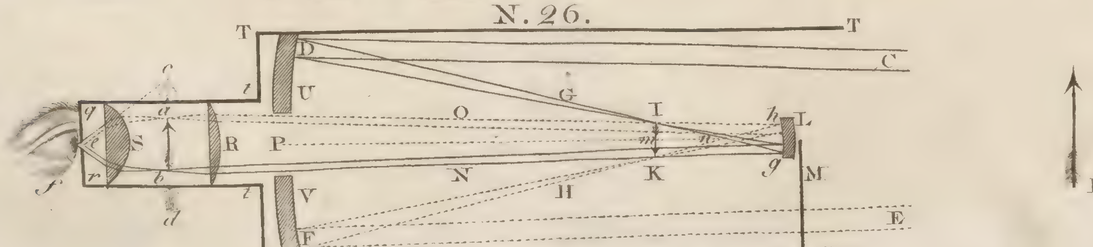

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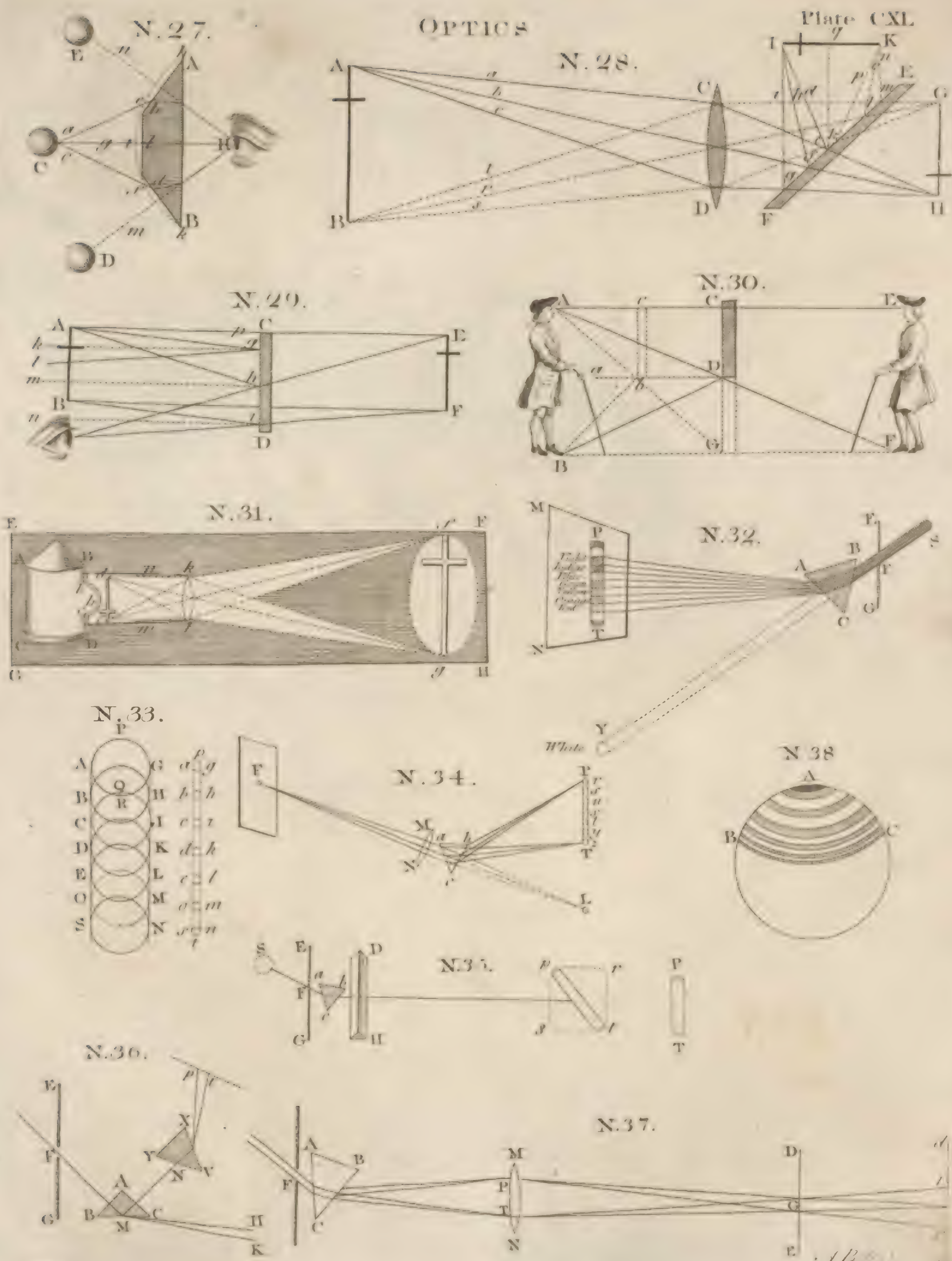
OPTICS



OPTICS. Plate CXLI.

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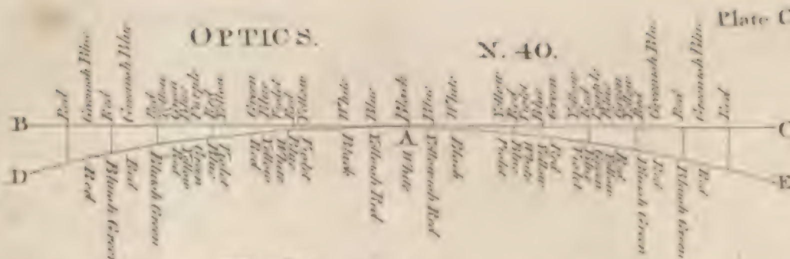

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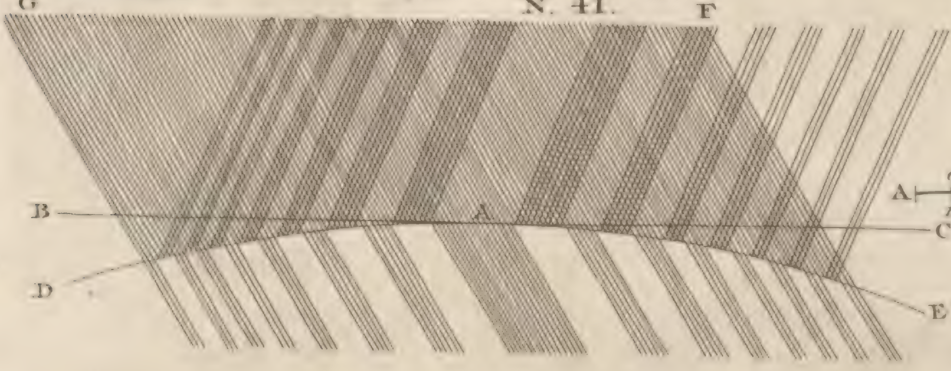

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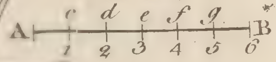

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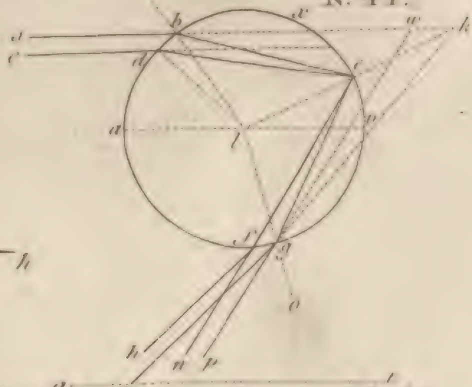

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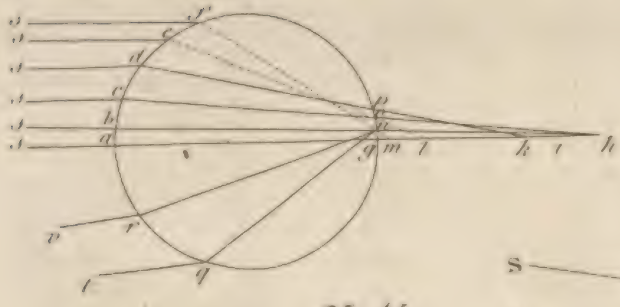

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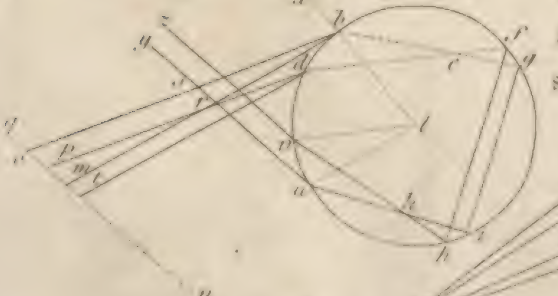

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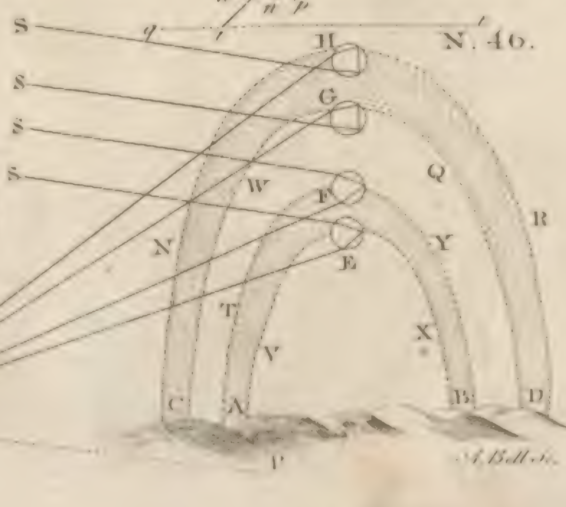

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in all the magazines, garrifons, and forts, in Great Britain.

ORDONNANCE, in architecture, is the compofition of a building, and the difpofition of its parts, both with regard to the whole and to one another; or, as Mr. Evelyn expreffes it, determining the meafure of what is affigned to the feveral apartments.

ORE, in natural hiftory, the compound mineral glebe, earth, ftone, or other fubftance, which is rich enough in metallic particles to be worth the while of being purified, and by this means to feparate the metal from it, whether gold, filver, copper, *&c.* See CHEMISTRY.

OREBRO, the capital of the province of Nericia, in Sweden: E. long. 15°, N. lat. 59° 20′.

OREGRUND, a port-town of Sweden, in the province of Upland: E. long. 18° 15′, N. lat. 60° 30′.

ORFORD, a borough and port town of Suffolk, thirty miles eaft of Bury. It fends two members to parliament.

ORGAL, among dyers, denotes the lees of wine dried.

ORGAN, in general, is an inftrument or machine defigned for the production of fome certain action or operation; in which fenfe, the mechanic powers, machines, and even the veins, arteries, nerves, mufcles, and bones of the human body, may be called organs.

ORGAN, in mufick, the largeft and moft harmonious wind-inftrument.

The invention of the organ is very ancient, though it is agreed that it was very little ufed till the eighth century. It feems to have been borrowed from the Greeks. Vitruvius defcribes an hydraulic one in his tenth book of architecture. The emperor Julian has an epigram in its praife. St. Jerome mentions one with twelve pair of bellows, which might be heard a thoufand paces, or a mile; and another at Jerufalem, which might be heard at the mount of Olives.

There is one in the cathedral church of Ulm, in Germany, that is ninety-three feet high, and twenty-eight broad; the biggeft pipe is thirteen inches in diameter; and it has fixteen pair of bellows.

The modern organ is a buffet, containing feveral rows of pipes. The fize of the organ is generally expreffed by the length of its biggeft pipe; thus we fay an organ of thirty-two feet, of fixteen, of eight, and of two feet.

Hydraulic ORGAN, denotes a mufical machine that plays by means of water inftead of wind. Of thefe there are feveral in Italy in the grottoes of vineyards. Ctefebes of Alexandria, who lived in the time of Ptolemy Eurgetes, is faid to have firft invented organs that played by compreffing the air with water, as is ftill practifed. Archimedes and Vitruvius have left us defcriptions of the hydraulic organ.

ORGASM, an ecftacy, or impetuous defire of coition, occafioned by a turgefcency of the feminal veffels.

ORGIA, in antiquity, feafts and facrifices performed in honour of Bacchus, inftituted by Orpheus, and chiefly celebrated on the mountains by wild diftracted women, called Bacchæ. See BACCHANALIA, and DIONYSIA.

ORGIVA, a town of Spain, in the province of Granada, twenty-five miles fouth of Granada.

ORGUES, in the military art, are thick, long pieces of wood, pointed at one end, and fhod with iron, clear one of another; hanging each by a particular rope, or cord, over the gate-way of a ftrong place, perpendicularly, to be let fall in cafe of an enemy.

ORGUES is alfo ufed for a machine, compofed of feveral harquebufs or mufquet-barrels bound together, by means whereof feveral explofions are made at the fame time, ufed to defend breaches and other places attacked.

ORGYA, an ancient Grecian meafure, containing fix feet.

ORIA, a town of Italy, in the kingdom of Naples, and territory of Otranto, fituated thirty miles north-weft of the city of Otranto.

ORIFICE, the mouth or aperture of a tube, pipe, or other cavity.

ORIGANUM, in botany, a genus of the didynamia gymnofpermia clafs. The ftrobilus is triangular and fpiked. There are eleven fpecies, two of which are natives of Britain, *viz.* the vulgare, or wild marjoram; and the onites, or pot-marjoram.

ORIGENISTS, in church-hiftory, a Chriftian fect in the fourth century, fo called from their drawing their opinions from the writings of Origen. The origenifts maintained, that the fouls of men had a pre-exiftent ftate; that they were holy intelligences, and had finned in heaven before the body was created: that Chrift is only the fon of God by adoption: that he has been fucceffively united with all the angelical natures, and has been a cherub, a feraph, and all the celeftial virtues, one after another: that in future ages, he will be crucified for the falvation of the devils, as he has already been for that of men; and that their punifhment, and that of the damned, will continue only for a certain limited time.

ORIGINAL, a firft draught or defign of any thing, which ferves as a model to be imitated or copied.

ORIGINAL SIN, the crime of eating the forbidden fruit, of which it is faid all mankind are guilty at their conception by the imputation of Adam's tranfgreffion; which is accounted for by fuppofing, that Adam, as he was to be the father, was alfo the fœderal head and reprefentative, of the whole human race; and that on his finning, all that were to fpring from him partook of his crime.

ORIGUELLA, a city of Spain, in the province of Valencia: W. long. 50′, N. lat. 38° 20′.

ORILLON, in fortification, is a fmall rounding of earth faced with a wall; raifed on the fhoulder of thofe baftions that have cafemates, to cover the cannon in the retired flank, and prevent their being difmounted by the enemy. See FORTIFICATION.

ORIOLUS, in ornithology, a genus belonging to the order of picæ. The bill is conical, convex, very fharp, and ftrait, the fuperior mandible being much longer than the under one; and the tongue is forked and fharp. There are 20 fpecies, principally diftinguifhed by their colour.

ORION, in aftronomy. See ASTRONOMY, p. 487.

ORIXA, the capital of the province of the fame name, in the hither India, fituated on the weft fide of the bay of Bengal.

ORKNEY ISLANDS, certain iflands on the north of Scotland, from which they are feparated by a frith twenty miles in length, and ten in breadth. Thefe iflands are forty in number, and together with the ifland of Zetland fend one member to parliament, and another for the burghs of Kirkwall, *&c.*

ORLE, ORLET, or ORLO, in architecture, a fillet under the ovolo or quarter round of a capital. When it is at the top or bottom of the fhaft, it is called cincture.

Palladio uses the word orlo, for the plinth of the bases of the columns.

ORLE, in heraldry, an ordinary, in form of a fillet, drawn round the shield, near the edge or extremity thereof, leaving the field vacant in the middle. Its breadth is but half that of the tressure or bordure, which contains a sixth part of the shield; and the orle, only a twelfth: besides that the orle is its own breadth distant from the edge of the shield, whereas the bordure comes to the edge itself. The form of the orle is the same with that of the shield; whence it resembles an escutcheon. See Plate CXXXIV. fig. 6. which represents an orle argent in a field gules.

ORLEANOIS, a province or government of France, bounded by Normandy and the isle of France, on the north; by Champaign and Burgundy, on the east; by Lyonois and Guienne, on the south; and by Britany and the bay of Biscay, on the west.

ORLEANS, a city of France, capital of Orleanois, situated on the river Loire, in E. long. 2°, N. lat. 47° 55′.

ORLEANS is also the name of an island and town on the river of St. Laurence, in Canada: W. long. 73°, N. lat. 47°.

ORLOPE, in the sea-language, the uppermost space or deck in a great ship, reaching from the main-mast to the mizen. In three-deck ships, the second and lowest decks are sometimes called orlopes.

ORMOND, the north division of the county of Tipperary in Ireland.

ORMUS, an island at the entrance of the gulph of Persia, situated opposite to Gombron on the continent, in E. long. 56°, N. lat. 27° 30′.

This island is thirty miles in circumference.

ORNITHOGALUM, in botany, a genus of the hexandria monogynia class. The corolla consists of six erect petals; and the filaments are alternately wider at the base. There are 11 species, three of them natives of Britain, *viz.* the luteum, or yellow star of Bethlehem; the pyrenaicum, or spiked star of Bethlehem; and the umbellatum, or common star of Bethlehem.

ORNITHOLOGY, that branch of natural history which treats of birds. See NATURAL HISTORY.

ORNITHOMANCY, a species of divination, performed by means of birds; being the same with augury. See DIVINATION and AUGURY.

ORNIOPHTUS, in botany, a genus of the diadelphia decandria class. The pod is jointed, cylindrical, and arcuated. There are four species, only one of which, *viz.* the perpusillus, or birds-foot, is a native of Britain.

OROBANCHE, in botany, a genus of the didynamia angiospermia class. The calix is bifid, and the corolla ringent; the capsule has two valves, and contains many seeds. There are seven species, two of them natives of Britain, *viz.* the major, or broom-rape; and the ramosa, or branched broom-rape.

OROBUS, in botany, a genus of the diadelphia decandria class. The stylus is linear; the calix is blunt at the base, the superior segments of it being shorter. There are nine species, two of them natives of Britain, *viz.* the tuberosus, or wood-pease; and the sylvaticus, or bitter vetch.

ORONOQUE, a river of South America, which falls into the Atlantic ocean in 8° N. lat. almost opposite to the island of Trinity.

ORONTIUM, in botany, a genus of the hexandria monogynia class. The spadix is cylindrical, and covered with floscules; the corolla consists of six petals; it has no stylus; and the capsule has three cells. There is but one species, a native of Virginia.

ORPHAN, a fatherless child, or minor; or one that is deprived both of father and mother.

ORPHUS, in ichthyology. See SPARUS.

ORPIMENT, in natural history, a fossile substance usually found in copper-mines, composed of thin flakes, like the talcs; which easily split, and are flexible, and not elastic, soluble in oil, fusible in a moderate fire, and yielding in burning an offensive smell like garlic.

Of this genus of fossils, there are only three known species: 1. A broad-flaked, gold-coloured kind, much esteemed at present by our painters. This is found in several places, as in the islands of the Archipelago, in the mines of Gosselaer in Saxony, in some parts of Turky, and in the East-Indies, and in its utmost purity about Smyrna; this makes the finest of all yellows in painting. 2. The small-flaked yellow kind, which is the common orpiment of the shops, and is a fine colour, though greatly inferior to the former. This is found in many parts of the Turkish dominions, and in Germany. And, 3. Red-orpiment, which is of a fine bright red: this is a very beautiful substance of a fine bright red, very glossy, and a little transparent, and is found in the Turkish dominions, in the islands of the Archipelago, and even in Cornwall, where it is known under the name of red mundic.

Geoffroy declares it a corrosive and poisonous mineral: on the other hand, Boerhaave declares orpiment an innocent and harmless medicine; and Hoffman, who has been at more pains than any body to examine into its nature, declares the same, and even gives instances of its being given to dogs without any harm.

It is an excellent depilatory, mixed with lime, and made into a paste with water. The painters are fond of it as a golden colour; and a lixivium of it, with quick-lime, makes sympathetic ink.

ORPINE, in botany. See SEDUM.

ORRERY, a curious machine, or movement, for representing the motions and appearances of the heavenly bodies. See ASTRONOMY, p. 495.

ORRICE. See IRIS.

ORTEGAL *castle and cape*, the most northerly promontory of Spain, thirty miles north-east of Ferrol: W. long. 8° 22′, N. lat. 44°.

ORTEGIA, in botany, a genus of the triandria monogynia class. The calix consists of five leaves; the corolla is wanting; and the capsule has one cell, and many seeds. There is but one species, a native of Spain.

ORTHODOX, in church-history, an appellation given to those who are sound in all the articles of the Christian faith.

ORTHOGRAPHIC *projection of the sphere*, that wherein the eye is supposed at an infinite distance; so called, because the perpendiculars from any point of the sphere will all fall in the common intersection of the sphere, with the plane of the projection.

ORTHO-

ORTHOGRAPHY, that part of grammar which teaches the nature and affections of letters, and the juſt method of ſpelling or writing words with all the proper and neceſſary letters, making one of the four greateſt diviſions or branches of grammar. See GRAMMAR.

ORTHOGRAPHY, in geometry, the art of drawing or delineating the fore-right plan of any object, and of expreſsing the heights or elevations of each part. It is called orthography, from its determining things by perpendicular lines falling on the geometrical plane.

ORTHOGRAPHY, in architecture, the elevation of a building.

ORTHOGRAPHY, in perſpective, is the fore-right ſide of any plane, *i. e.* the ſide or plane that lies parallel to a ſtraight line, that may be imagined to paſs through the outward convex points of the eyes, continued to a convenient length.

ORTHOPNOEA, in medicine, a ſpecies or degree of aſthma, where there is ſuch a difficulty of reſpiration, that the patient is obliged to ſit or ſtand upright, to be able to breathe. See MEDICINE.

ORTON, a market town of Weſtmoreland, ſituated ten miles ſouth-weſt of Appleby.

ORVALA, in botany, a genus of the didynamia gymnoſpermia claſs. The ſuperior lip of the corolla is divided into three ſegments, each being teethed; and the inferior lip is cordated and crenated. There is but one ſpecies, a native of Italy.

ORVIETTO, a city of Italy, in the pope's territories, capital of the province of Orvietto, ſituated at the confluence of the Tiber and the Chiane: E. long. 13°, N. lat. 43°.

ORWELL, a river of Suffolk, which, riſing in the middle of that country, runs ſouth-eaſt by Ipſwich, and falls into the German ſea at Languard-fort.

ORYZA, RICE, in botany, a genus of the hexandria digynia claſs. The calix is a double-valved glume, with one flower; and the corolla conſiſts of two equal valves. There is but one ſpecies.

This plant is cultivated in vaſt abundance in the Eaſt, as alſo in Carolina, for food. It is ſaid to be good in dyſenteries, diarrhœas, *&c.*

OSACA, a great city and port-town of Japan, ſituated on a bay of the ſea, on the eaſt ſide of the iſland: in E. long. 135°, N. lat. 35°.

OSBECKIA, in botany, a genus of the octandria monogynia claſs. The calix conſiſts of four ſegments, and the corolla of four petals; and the capſule has four cells. There is but one ſpecies, a native of India.

OSCHEOCELE, in ſurgery, a hernia of the ſcrotum. See SURGERY.

OSCILLATION, in mechanics, the vibration, or reciprocal aſcent and deſcent of a pendulum. See MECHANICS.

OSMUNDA, in botany, a genus of the cryptogamia filicum claſs. The ſpike is full of branches, and the fructification is round. There are 17 ſpecies, none of them natives of Britain.

OSNABURG, the capital of the biſhopric of the ſame name, in the circle of Weſtphalia: E. long. 7° 40′, N. lat. 52° 31′. The territories of this biſhopric, which are forty miles long and thirty broad, are ſubject to its biſhop: and this biſhopric is alternately held by a proteſtant and papiſt, the proteſtant being always a prince of the houſe of Brunſwic.

OSORNO, a town of Chili in South America: W. long. 80°, S. lat. 41°.

OSPREY. See FALCO.

OSSIFICATION, the formation of bones, but more particularly the converſion of parts naturally ſoft to the hardneſs and conſiſtence of bones. See ANATOMY, p. 148.

OSSORY, the weſt diviſion of Queen's county in Ireland.

OSSUNA, a town of Spain, in the province of Andaluſia, forty miles eaſt of Seville.

OSTAGIO, a town of Italy in the territory of Genoa, fifteen miles north-weſt of Genoa.

OSTEND, a city and port-town of the Auſtrian Netherlands, in the province of Flanders, ſituated twelve miles weſt of Bruges: E. long. 2° 45′, N. lat. 51° 15°.

OSTEOCOLLA, in natural hiſtory, though ſuppoſed by many to be an earth, is truly a cruſtated kind of ſpar, debaſed by earth, and therefore not tranſparent.

It is uſually found coating over vegetable, or other bodies, in form of incruſtations; ſo that the true oſteocolla is a tubular cruſtaceous ſpar, of a very foul and coarſe texture, and carries with it much more of the appearance of a marl than of a ſpecies of ſpar.

The maſſes of oſteocollo, though regularly of the ſame figure, are very different in ſize; ſome of them being not thicker than a crow-quill, and others of five and ſix inches diameter; it is always, however, of a tubular figure, and a wrinkled and rough ſurface.

Oſteocollo is frequent in Germany, where it is found buried near the ſurface of the earth, ſometimes in ſtrata of ſand, but more frequently among marls: it ſhould be choſen for uſe, the pureſt that can be had of a pale brown colour, and of a tolerably cloſe and firm texture.

It has long been famous for bringing on a callus in fractured bones; its name oſteocollo ſignifying the bone-glue, or bone-binder. It is alſo recommended as a diuretic, and as good in the fluor albus: but, at preſent, little regard is paid to it; ſince, if it has any virtues, they muſt be wholly owing to ſpar, which may be given to greater advantage in a purer form.

OSTEOLOGY, that branch of anatomy which treats of the bones. See ANATOMY, Part I.

OSTEOSPERMUM, in botany, a genus of the ſyngeneſia polygamia neceſſaria claſs. The receptacle is naked; it has no pappus; the calix conſiſts of many leaves; and the ſeeds are round and hard. There are five ſpecies, none of them natives of Britain.

OSTIA, a port-town of Italy, in the pope's territories, ſituated at the mouth of the Tiber: E. long. 13°, N. lat. 41° 30′.

OSTRACION, in zoology, a genus of the amphibia nantes claſs. It has ten long, cylindrical, obtuſe teeth in each jaw; the aperture is linear; the body is covered with a bony ſubſtance; and it has no belly-fins. There are nine ſpecies, principally diſtinguiſhed by the angles of their bodies and the number of ſpines near the tail.

OSTRACISM, in Grecian antiquity, denotes the baniſhment of ſuch perſons whoſe merit and influence gave umbrage to the people of Athens, leſt they ſhould attempt any thing againſt the public liberty. It was ſo called, becauſe the people

ple voted a person's banishment, by writing his name on shells, and casting them into an urn.

OSTRACITES, in natural history, the name by which authors call the fossile oyster-shell.

Ostracites has the same medicinal virtues with the belemnites, and lapis judaicus, only in a higher degree; being accounted by Dr. Lister one of the greatest known medicines in nephritic cases: the dose, in powder, is from half a dram to a dram, in white-wine; and to prevent a sickness at the stomach, that sometimes attends the taking it, one third part of the quantity of powdered chamomile-flowers may be mixed with it.

OSTREA, the OYSTER, in zoology, a genus belonging to the order of vermes testacea. The shell has two unequal valves; the cardo has no teeth, but a small hollow pit, with transverse lateral streaks. There are 31 species, principally distinguished by peculiarities in their shells. The common oister is used both raw, and variously prepared as food.

OSTRICH, in ornithology. See STRUTHIO.

OSWEGO, a town of the Iroquois, in North America, three hundred miles west of Albany, in New-York.

OSWESTRY, a market-town in Shropshire, fifteen miles north-west of Shrewsbury.

OSYRIS, in botany, a genus of the diæcia triandria class. The calix of both male and female consists of three segments; neither of them have any corolla; the female has no stylus, but a roundish stigma; and the drupa has but one cell. There is only one species, a native of Italy.

OTHONNA, in botany, a genus of the syngenesia polygamia necessaria class. The receptacle is naked; it has no pappus; and the calix is somewhat cylindrical, and consists of many leaves. There are seven species, two of them natives of Britain, *viz.* the palustris, or marsh fleabane; and the integrifolia, or mountain ragwort.

OTIS, in ornithology, a genus of birds belonging to the order of grallæ. The superior mandible of the bill is arched; the nostrils are oval; the tongue is bifid; the feet are made for running, being furnished with four toes. There are four species, principally distinguished by their colour.

OTLEY, a market-town, twenty-one miles west of York.

OTOQUE, an island situated in the bay of Panama, from whence the city is furnished with provisions: W. long. 82°, N. lat. 7°.

OTRANTO, a city and archbishop's see of the kingdom of Naples, situated at the entrance of the gulph of Venice: E. long. 19° 15′, N. lat. 40° 12′.

OTTER, in zoology. See MUSTELA.

OTTOMAN, or OTHOMAN, an appellation given to the Turkish empire, from Othomannus, or Osmanhus, the first emperor of the present family.

OTTONA, or ORTONA, a city of the kingdom of Naples, situated on the gulph of Venice: in E. long. 15° 30′, N. lat. 42° 22′.

OVAL, an oblong curvilinear figure, otherwise called ellipsis. See CONIC SECTIONS.

OVARIES, in anatomy. See ANATOMY, p. 275.

OVATION, in the Roman antiquity, a lesser triumph, allowed to commanders for victories won without the effusion of much blood; or for defeating a mean and inconsiderable enemy. The show generally began at the Albanian mountain, whence the general with his retinue made his entry into the city on foot, with many flutes or pipes sounding in concert as he passed along, and wearing a garland of myrtle as a token of peace. The term ovation, according to Servius, is derived from *ovis*, sheep, because on this occasion the conqueror sacrificed a sheep, as in triumph he sacrificed a bull.

OUDENARDE, a town of the Austrian Netherlands, in the province of Flanders, situated on the river Scheld, thirteen miles south of Ghent.

OUDENBURG, a town of the Austrian Netherlands, in the province of Flanders, five miles south-east of Ostend.

OVERHALE, in the sea-language. A rope is said to be overhaled ween drawn too stiff, or haled the contrary way.

OVER-RAKE, among seamen: When a ship, riding at anchor, so overbeats herself into an high sea, that she is washed by the waves breaking in upon her, they say the waves over-rake her.

OVERSMAN, in Scots law; a person named by arbiters, or by the parties submitters, to determine the matter submitted, in case the parties disagreee in their opinion.

OVERT, the same with open: thus an overt act signifies an act which, in law, must be clearly proved; and such is to be alledged in every indictment for high treason.

OVERTURE, or OUVERTURE, opening or preluding; a term used for the solemnities at the beginning of a public act or ceremony; an opera, tragedy, concert of musick, *&c.*

The overture of the theatre, or scene, is a piece of musick usually ending with a fugue: the overture of a jubilee is a general procession, *&c.*

OVERYSCHE, a town of the Austrian Netherlands, in the province of Brabant, situated on the river Ysche, nine miles north-east of Brussels.

OVERYSSEL, one of the united provinces, bounded by Groningen on the north, by Westphalia on the east, by Zutphen on the south, and by Guelderland, the Zuyder-sea, and Friesland, on the west.

OVIEDA, in botany, a genus of the didynamia angiospermia glass. The calix consists of five segments; the corolla is a long cylindrical tube; and the berry is round, containing two seeds. There are two species, none of them natives of Britain.

OVIEDO, a city of Spain, capital of the province of Asturias; situated on the river Asta, fifty miles north of Leon, in W. long. 6° 40′, N. lat. 43° 30.

OVILIA, or SEPTA, in ancient Rome, a place in the campus martius, at first railed in like a sheep-pen, whence its name. Afterwards it was mounted with marble, and beautified with walks and galleries, as also with a tribunal, or seat of justice. Within this precinct, or inclosure, the people were called in to give their suffrages for the election of magistrates. The ascent into the ovilia was not by stairs, but by pontes, or narrow boards, laid there for the occasion; on which account *de ponte dejici* was to be denied the privilege of voting; and persons thus dealt with, were called depontani.

OVIPAROUS, a term applied to such animals as bring forth their young from eggs; as birds, insects, *&c*,

OVIS, in zoology, a genus of the mammalia class, and of the order of pecora; the characters of which are these: The horns are concave, turned backwards, twisted, and full of wrinkles; there are eight foreteeth in the under jaw, and no dog-teeth. The species are three, *viz.*

1. Aries,

1. Aries, or ram and sheep, the horns of which are shaped like a half moon, and compressed. This animal is perhaps the most gentle and inoffensive, and at the same time the most timid and stupid, of all quadrupeds. In a flock of sheep, there is always a leader, whose steps the rest implicitly and blindly follow. If he runs over a precipice, the whole flock follow his example, and cannot be restrained though evident destruction be the consequence. The smallest noise, if uncommon, makes them run precipitantly against each other, without knowing the cause of their danger, or being able to extricate themselves. In snow, they remain fixed in the same spot; and continue obstinately in that situation, unless they are forced to move by the shepherd or his dog. But though dastardly in itself, though almost devoid of sentiment and mental qualities, this animal is of the most extensive utility to man. It affords us both food and cloathing, besides the advantages we derive from its milk, its skin, and its tallow.

Love, the liveliest sentiment in all animals, is the only passion which inspires the ram with any degree of vivacity; when under the influence of this passion, he becomes petulant, runs against his neighbours, and sometimes even attacks the shepherd himself. But the ewe, or female, though in the same situation, does not appear to be in the least affected; she seems to have no other instinct than that of simply admitting the embraces of the ram, eating her food, and recognising her offspring; the lamb, on the other hand, is endowed with the same instinct of distinguishing its mother from the rest of the flock.

This animal, so soft and so simple in its nature and disposition, is likewise extremely weak and feeble in its constitution: They can endure but little fatigue; whenever they run, their hearts palpitate, and their wind fails them; they are equally incapable of bearing heat or cold, snow or rain: They are subject to many diseases, most of which are contagious: They bring forth their young with pain and difficulty, and require more care and attention than any other domestic animal.

The ram is capable of generation at the age of 18 months; and the ewe can be impregnated when a year old. One ram is sufficient for 30 or 40 ewes. He ought to be strong, well proportioned; his head should be thick and strong, his front large, his eyes black, his nose flat, his neck thick, his body long and tall, his testicles massy, and his tail long. White is the best colour for a ram. The ewes whose wool is most plentiful, bushy, long, soft, and white, are most proper for breeders, especially when at the same time they are of a large size, have a thick neck, and move nimbly.

Ewes are generally in season from the end of October to the beginning of April: However, they may be impregnated at any time, if they be fed with stimulating nourishment, as salt water, and bread made of hemp-seed. They go with young about five months, and generally bring forth but one at a time, though frequently two: In warm climates, they may bring forth twice in a year; but in Britain, France, and most parts of Europe, only once. They give milk plentifully for seven or eight months: Their milk affords nourishment for children and country-people; good cheese is made of it, especially when mixed with cow-milk. They live from 10 to 12 years, and are capable of bringing forth as long as they live.

When the male lambs are not intended to be kept for propagation, but fattened for food, they ought to be castrated at the age of five or six months. This operation is performed two ways: in the one, an incision is made and the testicles taken out; in the other, a ligature is tied tight round the scrotum, above the testicles, which soon destroys the vessels which nourish them. After castration, they are called weathers.

The ram, ewe, and weather, when one year old, lose the two foreteeth of the under jaw; six months afterwards, they lose the two foreteeth next to these; and at the age of three years, the teeth are all replaced. The age of a ram may likewise be discovered by their horns, which always appear the first year, and frequently as soon as they are brought forth. These horns uniformly acquire an additional ring every year as long as the creature lives. The ewes commonly have no horns, but a kind of long protuberances in place of them: However, some of them have two, and some four horns.

In Spain, and the southern parts of Europe, the flocks are kept in shades or stables during the night: but in Britain, where there is now no danger from wolves, they are allowed to remain without, both night and day; which makes the animals more healthy, and their flesh a more whole food. Dry and mountainous grounds, where thyme and sheep's fescue grass abound, are the best for the pasturing sheep.

2. The Guineensis, or Guinea sheep, has pendulous ears, lax hairy dew laps, and a prominence on the hind part of the head. The wool is short, like that of a goat. It is a native of Guinea.

3. The strepsiceros, or Cretan sheep, has strait carinated horns, twisted in a spiral manner. It is a native of Mount Iola.

OULNEY, a market-town of Buckinghamshire, situated nine miles south-east of Northampton.

OULZ, a town of Italy, in the province of Piedmont, situated in E long. 6° 30°, N. lat. 45°.

OUNCE, a little weight, the sixteenth part of a pound avoirdupois, and the twelfth part of a pound troy.

Ounce, in zoology. See Leo.

OUNDLE, a market-town of Northamptonshire, situated on the river Nen, twenty-two miles north-east of Northampton.

OVOLO, or Ovum, in architecture, a round moulding, whose profile, or sweep, in the ionic and composite capitals, is usually a quadrant of a circle: whence it is also commonly called the quarter-round.

It is usually cut with the representation of eggs and anchors or arrows heads placed alternately.

OUSE, a river, which, rising in the north of Yorkshire, runs south-east by York; and, continuing that course, falls into the Trent.

Ouse, is also a river which rises on the confines of Oxfordshire and Buckinghamshire; and running north-east through Buckinghamshire, Bedfordshire, Huntingdonshire, Cambridgeshire, and Norfolk, passes by Buckingham, Bedford, Huntington, and Ely, discharging itself into the bay of the German sea at Lynn.

OUSTIACH, or Ostiach *Country*, is a part of Asiatic Russia, extending along the river Irtis to its confluence with the river Oby, and from thence northward along the banks of the Oby and Jenisa, into the gulph of the Mangasea, or the frozen ocean; and extending also along

the banks of ſeveral rivers which fall into the Oby and Jeniſa.

OUTLAW, ſignifies one that is deprived of the benefit of the law, and therefore held to be out of the king's protection. See the next article.

OUTLAWRY, is where a perſon is outlawed, and on that account loſes the benefit of a ſubject,

The proceſs of outlawry lies in indictments of treaſon or felony, and alſo of treſpaſs vi & armis, conſpiracy, *&c.* And by ſtatute, perſons may be outlawed in many civil actions, as debt, caſe, covenant, *&c.*

OUTWORKS, in fortification, all thoſe works made without-ſide the ditch of a fortified place, to cover and defend it. See FORTIFICATION.

OUZEL, in ornithology. See MOTACILLA.

OWL, in ornithology. See STRIX.

OX, in zoology. See BOS.

OXALIS, in botany, a genus of the decandria pentagynia claſs. The calix conſiſts of five leaves; the petals are connected by the claws; and the capſule has five ſides. There are 14 ſpecies, only one of them, *viz.* the acetoſella, or wood-ſorrel, is a native of Britain.

OXFORD, the capital of Oxfordſhire, and the ſee of a biſhop; it is ſituated at the confluence of the Iſis and Cherwell, fifty-five miles weſt of London: W. long. 1° 15′, and N. lat. 51° 45′.

Oxford is moſt remarkable on account of its univerſity, which conſiſts of twenty colleges and five halls: this city ſends two members to parliament, and the univerſity as many.

OXGANG, or OXGATE, is generally taken, in our old law-books, for fifteen acres, or as much ground as a ſingle ox can plough in a year.

OXUCLÆ, in natural hiſtory, the name of a genus of foſſils of the claſs of the ſelenitæ, but of the columnar, not the rhomboidal kind.

Of this genus there are only two known ſpecies. 1. A fine kind, with thin flakes and tranſverſe filaments, found in the clayey banks of the river Nen, near Peterborough, in Northamptonſhire; and, 2. A dull kind, with thick plates and longitudinal filaments. This is not uncommon in Yorkſhire, and lies ſometimes in a yellow, ſometimes in a blue clay.

OXUS, a river which riſes in the mountains on the north of India; and running north-weſt, through Uſbec Tartary, afterwards ſeparates Perſia from Uſbec Tartary, and falls into the Caſpian ſea, in 44° N. lat.

OXYCOCCUS, in botany. See VACCINIUM.

OXYCRATE, in pharmacy, *&c.* a mixture of vinegar and water, proper to aſſwage, cool, and refreſh: they make fomentations of oxycrate, clyſters of oxycrate, *&c.* The uſual proportion is one ſpoonful of vinegar to five or ſix ſpoonfuls of water.

OXYCROCEUM, in pharmacy, *&c.* a preparation much uſed in plaſters for fractures, *&c.* made as follows: Take yellow wax, one pound; pitch and galbanum, each half a pound: melt them over a gentle fire; and then add of venice-turpentine, myrrh, and olibanum, each three ounces; ſaffron, two ounces: make them into a plaſter.

OXYGLYCU, a ſpecies of drink prepared of the ſweeteſt honey combs, macerated and boiled. The combs from which all the honey has been expreſſed, are put into a pot with pure water, and boiled till they ſeem to have depoſited all their contained honey in the water. This liquor is to be kept, and, when diluted with cold water, is to be drank in the ſummer-time, in order to remove thirſt.

OXYMEL, in pharmacy, a compoſition of vinegar and honey.

There are ſeveral ſorts of oxymel, whereof the ſimple kind is made by boiling, in a glazed earthern veſſel, and with a gentle fire, two pounds of clarified honey, in a pint of vinegar, to the conſiſtence of a ſyrup.

OYER, in law-books, ſeems to have been anciently uſed for what is now called aſſiſes.

OYER AND TERMINER, a commiſſion directed to the judge of aſſiſe, and other gentlemen, impowering them to hear and determine all criminal cauſes, and to try all offenders, whether for treaſon, felony, or treſpaſs.

OYES, or OYEZ, ſignifies *Hear ye;* and is frequently uſed by the criers in our courts, on making proclamations, or to enjoin ſilence.

OYSTER, in zoology. See OSTREA.

OZÆNA, a foul and malignant ulcer of the noſe, diſtinguiſhed by its fœtor, and often accompanied with a caries of the bones of the noſe.

P.

PABULUM. See FUEL and FIRE.

PACA, in zoology. See MUS.

PACE, a meaſure taken from the ſpace between the two feet of a man, in walking; uſually reckoned two feet and a half, and in ſome men a yard or three feet.

The geometrical pace is five feet; and 60000 ſuch paces make one degree of the equator.

PACE, in the manege, is of three kinds, *viz.* walk, trot, and gallop; to which may be added an amble, becauſe ſome horſes have it naturally.

Horſes which go ſhuffling or mixed paces, between the walk and amble, are for the moſt part of no value; which commonly proceeds from their fiery temper, and ſometimes from a weakneſs in their reins or legs.

PACHAMAC, a temple of Peru, in South America, dedicated by the Indians to the ſupreme being: it gives its name to the adjacent couuntry.

PACHODECARHOMBIS, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, expreſſing a thick rhomboidal body, compoſed of ten planes.

PACIFIC

PACIFIC OCEAN, that vaſt ocean which ſeparates Aſia from America: it is called Pacific, from the moderate weather the firſt mariners who failed in it met with between the tropics; and it was called ſouth-ſea, becauſe the Spaniards croſſed the iſthmus of Darien from north to ſouth, when they firſt diſcovered it: though it is properly the Weſtern ocean, with regard to America.

PACK, in commerce, denotes a quantity of goods, made up in loads, or bales, for carriage.

A pack of wool is ſeventeen ſtone and two pounds, or a horſe's load.

PACKAGE, is a ſmall duty of one penny in the pound, paid for all goods not particularly rated.

PACOS, in zoology. See CAMELUS.

PACTOLUS, a river of Lydia in the leſſer Aſia, celebrated by the ancient poets for its golden ſands.

PADDOC, or PADDOC-COURSE, a piece of ground encompaſſed with pales or a wall, and taken out of a park for exhibiting races with grey-hounds, for plates, wagers, or the like.

PADERBORNE, the capital of the biſhopric of the ſame name in Weſtphalia: E. long. 8° 25′, N. lat. 51° 45′.

PADSTOW, a market-town of Cornwall, thirty miles weſt of Launceſton.

PADUA, the capital of the Paduan, in Italy, a city of a circular form, ſituated twenty-two miles weſt of Venice: E. long. 12° 15′, N. lat. 45° 30′.

PADUAN, a province of Italy, in the territories of Venice, thirty-five miles long, and almoſt as much in breadth; bounded by the Treviſane on the north, by the duchy of Venice on the eaſt, by the Poleſin de Rovigo on the ſouth, and by the Vicentin on the weſt.

PADUAN, among the medaliſts, a modern medal ſtruck in imitation of the antique; or a new medal ſtruck with all the marks and characters of antiquity.

PADUS, in botany. See PRUNUS.

PÆAN, among the ancient pagans, was a ſong of rejoicing ſung in honour of Apollo, chiefly uſed on occaſions of victory and triumph.

PÆAN, in the ancient poetry, a foot conſiſting of four ſyllables; of which there are four kinds, the pæan primus, ſecundus, *&c.*

The pæan primus conſiſts of one long ſyllable and three ſhort ones, or a trochæus and pyrrhichius, as *temporibus;* the pæan ſecundus conſiſts of a ſhort ſyllable, a long, and two ſhort, or an iambus and a pyrrhichius, as *potentia*; the pæan tertius conſiſts of two ſhort ſyllables, a long and a ſhort one, or a pyrrhichius and a trochæus, as *animatus;* the pæan quartus conſiſts of three ſhort ſyllables and a long one, or a pyrrhichius and iambus, as *celeritas*.

PÆDEROTA, in botany, a genus of the diandria monogynia claſs, of which there are two ſpecies, none of them natives of Britain.

PÆDO-BAPTISM, infant-baptiſm, or that conferred on children.

PÆONIA, in botany, a genus of the polyandria digynia claſs. The calix conſiſts of five leaves, and the corolla of five petals; the ſtylus is wanting; and the capſule contains many ſeeds. There are two ſpecies, none of them natives of Britain.

The root of this plant is a very celebrated medicine in nervous caſes.

PAGAN, a heathen, gentile, or idolater; one who adores falſe gods. See MYTHOLOGY.

PAGANALIA, certain feſtivals obſerved by the ancient Romans in the month of January. They were inſtituted by Servius Tullius, who appointed a certain number of villages (pagi), in each of which an altar was to be raiſed for annual ſacrifices to their tutelar gods; at which all the inhabitants were to aſſiſt, and give preſents in money, according to their ſex and age, by which means the number of country-people was known. The ſervants upon this occaſion offered cakes to Ceres and Tellus, to obtain plentiful harveſts.

PAGANELLUS, in ichthyology. See GOBIUS.

PAGANISM, the religious worſhip and diſcipline of pagans; or, the adoration of idols and falſe gods. See IDOLATRY and MYTHOLOGY.

PAGEANT, a triumphal car, chariot, arch, or other like pompous decoration, variouſly adorned with colours, flags, *&c.* carried about in public ſhews, proceſſions, *&c.*

PAGOD, or PAGODA, a name whereby the Eaſt-Indians call the temple in which they worſhip their gods.

PAGOD, or PAGODA, is alſo the name of a gold and ſilver coin, current in ſeveral parts of the Eaſt-Indies.

PAIN, is defined to be an uneaſy ſenſation ariſing from a ſudden and violent ſolution of the continuity, or ſome other accident in the nerves, membranes, veſſels, muſcles, *&c.* of the body; or, according to ſome, it conſiſts in a motion of the organs of ſenſe; and, according to others, it is an emotion of the ſoul occaſioned by theſe organs.

PAINTING, the art of repreſenting natural bodies, and giving them an appearance of life, by the turn of lines, and the degrees of colours.

Whoever would apply himſelf to painting, ſays Leonardo da Vinci, muſt in the firſt place learn perſpective: this will enable him to diſpoſe things in their proper places, and to give the due dimenſions to each: having done this, he muſt learn to deſign; chuſing for that purpoſe ſome able maſter, who at the ſame time may give him ſome inſight into the colours of figures: he ought then to conſult nature, to confirm himſelf in what he has already learnt; and, laſtly, let him apply himſelf to the ſtudy and imitation of the greateſt maſters, in order to get a habit of reducing what he has learnt into practice.

To judge of the goodneſs of a painting, it is neceſſary to eſtabliſh to ourſelves a ſyſtem of rules to be applied occaſionally; and to aſſiſt the judgment herein, the following rules have been laid down: 1. The ſubject muſt be finely imagined, and, if poſſible, improved in the painter's hands; he muſt think well as an hiſtorian, poet, philoſopher, or divine, and more eſpecially as a painter, in making a wiſe uſe of all the advantages of his art, and in finding expedients to ſupply its defects. 2. The expreſſion muſt be proper to the ſubject, and the characters of the perſons: it muſt be ſtrong, ſo that the dumb ſhew may be perfectly and readily underſtood: every part of the picture muſt contribute to this end; colours, animals, draperies, and eſpecially the actions of the figures, and above all the airs of the heads. 3. There muſt be one principal light; and this, and all the ſubordinate ones, with the ſhadows and repoſes, muſt make one entire and harmonious maſs; the ſeveral parts muſt be well connected and contraſted, ſo as to render the whole as grateful

ful to the eye, as a good piece of musick to the ear. By this means the picture is not only more delightful, but better seen and comprehended. 4. The drawing must be just; nothing must be flat, lame, or ill proportioned; and these proportions should vary according to the characters of the persons drawn. 5. The colouring, whether gay or solid, must be natural, beautiful, and clean, and what the eye is delighted with, in shadows, as well as lights and middle tints; and whether the colours are laid on thick, or finely wrought, they must appear to be done by a light and accurate hand. Lastly, Nature must be the foundation that must be seen at the bottom; but nature must be raised and improved, not only from what is commonly seen, to what is but rarely met with, but even yet higher, from a judicious and beautiful idea in the painter's mind, so that grace and greatness may shine throughout more or less according to the subject.

Painting is of various kinds, according to the materials used, the matter upon which they are applied, and the manner of applying them; as painting in oil, in water-colours, fresco, &c.

PAINTING *in oil*. The whole secret of painting in oil consists in grinding the colours with nut oil, or linseed-oil; but the manner of working is very different from that in fresco, or in water, by reason the oil does not dry near so fast, which gives the painter an opportunity of touching and re-touching all the parts of his figures as often as he pleases; which in the other methods of painting is a thing impracticable. The figures done in oil are also capable of more force and boldness; insomuch that the black becomes blacker, when ground with oil, than with water; besides, all the colours mixing better together, makes the colouring the sweeter, more delicate and agreeable, and gives an union and tenderness to the whole, inimitable in any of the other manners.

Painting in oil is performed on canvas, on walls, wood, stone, and all sorts of metals. 1. Painting on cloth or canvas is done as follows: The canvas being stretched on a frame, give it a layer of size, or paste-water, and then go over it with a pumice-stone to smooth off the knots. By means of the size, the little threads and hairs are all laid close on the cloth, and the little holes filled up, so that no colour can pass through. When the cloth is dry, lay on oker in oil, which may be mixed with white-lead to make it dry the sooner. When dry, go over it again with the pumice-stone, to make it smooth. After this a second couch is sometimes applied, composed of white-lead and a little charcoal-black, to render the ground of an ash colour. Others prime the canvas in the following manner: They first smooth the canvas with a pumice-stone, size it over with a good size and a little honey, and let it stand to dry; after which they lay it over with whiting and size, mixed with a little honey: the use of the honey is to prevent it from cracking, peeling, and breaking out; on this they first draw the picture with a coal, and then lay on the colours. 2. Painting on walls: When the wall is dry, they give it two or three washes with boiling oil; till the plaster remains quite greasy, and will imbibe no more; upon this they lay drying colours, such as white-chalk, red-oker, or other chalks beaten pretty stiff. When this couch or layer is well dried, the subject or design is sketched out, and afterwards painted over, mixing a little varnish with their colours, to save the varnishing afterwards. In order the better to fortify the wall against moisture, some cover it with a plaster of lime, marble-dust, or a cement made of beaten tiles soaked in linseed-oil; and at last prepare a composition of green-pitch, mastic, and thick varnish boiled together, which they apply hot over the former plaster; and when dry, lay on the colours as before. Others, in fine, make their plaster with lime-mortar, tile-cement, and sand; and this being dry, they apply another of lime, cement, and iron scoriæ; which being well beaten, and incorporated with linseed-oil and whites of eggs, makes an excellent plaster. When this is dry, the colours are laid on as before. 3. In painting on wood, they usually give their ground a couch or layer of white tempered with size, and then proceed as in painting on walls. 4. In painting on stone or metals, it is not necessary to lay them over with size, but only to add a slight couch of colours before the design is drawn on it; nor even is this done on stones, where you would have the ground appear, as in certain marbles and agates of extraordinary colours.

All the colours used in fresco are good in oil, except white of lime and marble dust. Those chiefly used are white-lead, or ceruse, yellow and white masticot, orpiment, vermilion, lacca, blue and green ashes, verdigrease, indigo, smalt, black-lead, ivory-black, lamp-black, &c. As to oils, the best are those of linseed, walnuts, spike, and turpentine. The drying oils are nut-oil, boiled with litharge and sandarach, and otherwise with spirit of wine, mastic, and gum-lacca.

In the preparation of oil-colours, care must be taken that they be ground fine; that in putting them on a pallet, those which will not dry of themselves be mixed with drying oil, or other ingredients of a dying quality; and that the tinged colours be mixed in as small quantities as possible. As to the situation of the colours, the purest and strongest must be placed in the front of the piece, and the colouring varied according to the subject, time, and place. If the subject be grave, melancholy, or terrible, the general tint of the colouring must incline to brown and black, or red and gloomy; but it must be gay and pleasant, in subjects of joy and triumph.

PALÆSTRA, in Grecian antiquity, a public building, where the youth exercised themselves in wrestling, running, playing at quoits, &c.

PALÆSTROPHYLAX, was the director of the palæstra and the exercises performed there.

St. PALAIS, a town of France, in the province of Gascony, capital of the lower Navarre, situated in W. long. 1° 8′, N. lat. 43° 23′.

PALAMBOANG, or PALAMBANG, the capital of a kingdom at the east end of the island of Java, in the East-Indies, situated on the straits of Bally, in E. long. 114°, S. lat. 7° 30′, and separated from the island of Bally by a narrow strait.

PALAMEDIA, in ornithology, a genus beloging to the order of grallæ. The bill is conical, the superior mandible being crooked; and the feet have three divided toes. There are two species, both natives of Brasil.

PALARIA, among the Romans, a kind of exercise, performed at a stake by the soldiers. The stake being fixed in the ground, and six feet high above it, the young undisciplined soldiers advanced against it, armed with a hurdle and cudgel, instead of a shield and sword, and went through all the rules of attack and defence, as if actually engaged

engaged with an adverſary. Sometimes they ſtood at a diſtance, and attacked with miſſive weapons, at the ſame time uſing all the requiſite motions for defending themſelves, and warding off what might be thrown againſt them.

PALATE, in anatomy. See ANATOMY, p. 162, 303.

PALATINATE, a province, or ſigniory, poſſeſſed by a palatine.

PALATINE, or COUNT PALATINE, a title anciently given to all perſons who had any office or employment in the prince's palace; but afterwards conferred on thoſe delegated by princes to hold courts of juſtice in the provinces; and on ſuch among the lords as had a palace, that is, a court of juſtice, in their own houſes.

At preſent the word palatine is reſtrained to a prince of Germany, or a lord of Poland, poſſeſſed of a palatine.

PALATO-SALPINGÆUS. See ANATOMY, p. 303.

PALATO-STAPHYLINUS, in anatomy. See ANATOMY, p. 303.

PALE, a little pointed ſtake or piece of wood, uſed in making incloſures, ſeparations, &c. The pale was an inſtrument of puniſhment and execution among the ancient Romans, and ſtill continues ſo among the Turks. Hence empaling, the paſſing a ſharp pale up the fundament through the body.

PALE, in heraldry, one of the honourable ordinaries of an eſcutcheon; being the repreſentation of a pale or ſtake placed upright, and comprehending the whole height of the coat from the top of the chief to the point. When the pale is ſingle, it is to contain one third of the breadth of the ſhield. See Plate CXXXIV. fig. 7.

PALERMO, the capital of the iſland of Sicily, ſituated on the north coaſt of that iſland, on a bay of the Mediterranean ſea: in E. long. 13°, N. lat. 38° 30′.

PALESTINE, a part of Aſiatic Turky, ſituated between thirty-ſix and thirty-eight degrees of eaſt longitude, and between thirty-one and thirty-four degrees of north latitude: it is bounded by Mount Libanus, which divides it from Syria, on the north; by Mount Hermon, which ſeparates it from Arabia Deſerta, on the eaſt; by the mountains of Seir and the Deſarts of Arabia Petræa, on the ſouth; and by the Mediterranean ſea, on the weſt.

It was called Paleſtine, from the Philiſtines who inhabited the ſea-coaſts. It was alſo called Judea, from Judah; and the Holy Land, from our Saviour's reſidence and ſufferings in it; and it is called Canaan, and the Promiſed Land, in the ſcriptures.

It is 150 miles in length, and 80 in breadth; and in the time of Solomon it ſeems to have extended from the Mediterranean ſea to the river Euphrates.

PALESTRINA, a city of Italy, in the pope's territory and Campania of Rome, ſituated thirty miles eaſt of Rome.

PALIMBAM, a town on the iſland of Sumatra, in the Eaſt-Indies, ſituated in E. long. 103°, S. lat. 3°.

PALINDROMUS, a verſe or ſentence which runs the ſame when read either backwards or forwards; ſuch is the verſe,

Roma tibi ſubito motibus ibit amor.

PALING, a ſort of fencing for fruit-trees planted in fields, wherein three ſmall poſts are erected at a foot and a half diſtance one from another, and near the top nailed to each other with croſs-bars.

PALINGENESIA, among divines, ſignifies the ſame with regeneration.

Among chemiſts, it denotes the producing a body from its principles.

PALINODY, a diſcourſe contrary to a preceding one: hence the phraſe *palinodiam canere* was taken for a recantation.

PALISADE, in fortification, an incloſure of ſtakes or piles driven into the ground, each ſix or ſeven inches ſquare, and eight feet long, three whereof are hid under ground.

PALISSE′, in heraldry, a bearing like a range of paliſades before a fortification, repreſented on a feſſe, riſing up a conſiderable height, and pointed a-top, with the field appearing between them. See Plate CXXXIV. fig. 8.

PALIURUS, in botany. See RHAMNUS.

PALL, in heraldry, denotes a kind of croſs repreſenting the pallium, or archiepiſcopal ornament ſent from Rome to the Metropolitans. See Plate CXXXIV. fig. 9.

PALLA, in Roman antiquity, a mantle which women wore over the gown called ſtola. It was borne on the left ſhoulder; whence paſſing to the other ſide, under the right arm, the two ends were bound under the left arm, leaving the breaſt and arm quite bare.

PALLADIUM, in antiquity, a ſtatue of the goddeſs Pallas, ſuppoſed to have dropped down from heaven, preſerved in Troy, whereon the fate of that city is ſaid to have depended.

PALLET, among painters, a little oval table, or piece of wood, or ivory, very thin and ſmooth; on and round which the painters place the ſeveral colours they have occaſion for, to be ready for the pencil. The middle ſerves to mix the colours on, and to make the tints required in the work. It has no handle, but inſtead thereof, a hole at one end to put the thumb through to hold it.

PALLET, in heraldry, is nothing but a ſmall pale, conſiſting of one half of it in breadth, and therefore there are ſometimes ſeveral of them upon one ſhield.

PALLET, in ſhip-building, is a room within the hold, cloſely parted from it, in which by laying ſome pigs of lead, &c. a ſhip may be ſufficiently ballaſted, without loſing room in the hold; which, therefore, will ſerve for the ſtowing the more goods.

PALLIATION, or a PALLIATIVE CURE, in medicine, is when, in deſperate and incurable diſeaſes, after predicting the fatal event, the phyſician preſcribes ſome remedies for mitigating the pain or ſome other urgent ſymptoms, as in ulcerated cancers, or cancerous fiſtulas, and the like.

PALLIUM, or PALL, an archiepiſcopal veſtment, of white woollen cloth, about the breadth of a border, made round, and thrown over the ſhoulders.

PALM-SUNDAY, in the Chriſtian church, the Sunday next before Eaſter; being ſo called in memory of our Saviour's triumphal entry into Jeruſalem when the multitude that attended him ſtrewed palm-branches in his way.

PALM-TREE, in botany. See PHOENIX.

PALMA ISLE, one of the Canary-iſlands, ſixty miles north-weſt of Teneriff.

PALMARIS, in anatomy. See ANATOMY, p. 199.

PALMATED, ſomething reſembling the ſhape of the hand: thus we ſay palmated leaves, roots, ſtones, &c.

PALMIPEDES, among ornithologiſts, the ſame with web-footed birds.

PALMISTRY, a kind of divination, or rather a deceitful art practiſed by gypſies, who pretend to foretel events by looking upon the lines and marks of the hand.

PALMYRA, the ruins of a magnificent city, in the province of Syria, two hundred miles ſouth-eaſt of Aleppo.

PALOS, a port-town of Spain, ſituated on the bay of Cadiz: W. long. 7° 15′, N. lat. 37°.

PALPABLE, ſomething perceiveable by the ſenſes, particularly that of feeling.

PALPITATION, a ſpaſtic contraction of the heart, when it leaps and beats violently.

PALSY, in medicine. See MEDICINE, p. 97.

PALUDAMENTUM, in Roman antiquity, a habit that differed in little from the chlamys, except that this laſt belonged chiefly to the lower claſs of people. See CHLAMYS.

PALUMBUS. See COLUMBA.

PALY, or PALE′, in heraldry, is when the ſhield is divided into four or more equal parts, by perpendicular lines falling from the top to the bottom. See Plate CXXXIV. fig. 10.

Paly bendy is when the eſcutcheon is divided by perpendicular lines, which is paly; and alſo by diagonals, which is called bendy. See the article BENDY.

PAMPELUNA, the capital of Spaniſh Navarre, is the ſee of a biſhop, and an univerſity: W. long. 1° 30′, N. lat. 43° 15′.

PANACEA, among phyſicians, denotes an univerſal medicine, or a remedy for all diſeaſes; a thing impoſſible to be obtained.

PANADA, a diet conſiſting of bread boiled in water to the conſiſtence of a pulp, and ſweetened with a little ſugar.

PANAMA, the capital city of the province of Darien, in South America, where the treaſures of gold and ſilver, and the other rich merchandize of Peru, are lodged in magazines till they are ſent to Europe: W. long. 82°, N. lat. 9°.

PANARO, a river of Italy, which riſing in the Appenine mountains, on the confines of Tuſcany, divides Modena from Romania, and then running through the Ferrareſe falls into the Gulph of Venice.

PANATHENÆA, in Grecian antiquity, an ancient Athenian feſtival, in honour of Minerva, who was the protectreſs of Athens, and called Athena.

PANAX, in botany, a genus of the polygamia diœcia claſs. The calix of the hermaphrodite has five teeth, and the corolla five petals; there are five ſtamina, and two ſtyli; and the berry contains two ſeeds. The calix of the male is entire; the corolla has five petals; and there are five ſtamina. The ſpecies are three, none of them natives of Britain.

PANAY, the capital of the iſle of Panay, one of the Philippine iſlands: E. long. 119°, and N. lat. 11°.

PANCARPUS, in Roman antiquity, a kind of ſhew which the Roman emperors frequently exhibited to the people. In this ſpectacle, the circus being ſet all over with large trees, repreſented a foreſt, into which the beaſts being let from the dens under the ground; the people, at a ſign given by the emperor, purſued, ſhot, cut in pieces, and killed all they could lay hold of, which they afterwards carried away, to regale upon at home. The beaſts uſually given on theſe occaſions were boars, deer, oxen, and ſheep.

PANCHYMAGOGUE, in pharmacy, a name given to ſome cathartic extracts.

PANCRATIUM, among the ancients, a kind of exerciſe, which conſiſted of wreſtling and boxing. In theſe conteſts it was cuſtomary for the weaker party, when he found himſelf preſſed by his adverſary, to fall down, and fight rolling on the ground.

PANCRATIUM, in botany, a genus of the hexandria monogynia claſs. It has ſix petals, and a nectarium divided into twelve ſegments, and the ſtamina lie upon the nectarium. There are ſeven ſpecies, none of them natives of Britain.

PANCREAS, in anatomy. See ANATOMY, p. 265.

PANDECTS, in the civil law, collections made by Juſtinian's order, of five hundred and thirty-four deciſions of the ancient lawyers, on ſo many queſtions occurring in the civil law; to which that emperor gave the force and authority of law, by an epiſtle prefixed to them. The pandects conſiſt of fifty books, and make the firſt part of the body of the civil law.

PANDICULATION, a ſtretching, or that violent and tenſive motion of the ſolids, which uſually accompanies the act of yawning.

PANEGYRIC, an oration in praiſe of ſome extraordinary thing, perſon, or virtue.

Panegyrics were anciently made in the public and ſolemn aſſemblies of the Greeks, either at their games, their feaſts, or religious meetings.

PANEGYRICUM, in church-hiſtory, an eccleſiaſtical book, uſed by the Greek church, containing the panegyrical orations of various authors on the ſolemnities of Jeſus Chriſt and the ſaints.

PANGONIA, in natural hiſtory, the name of a genus of cryſtal, conſiſting of ſuch as are compoſed of many angles.

PANIC, denotes an ill-grounded terror or fright.

PANICLE, in botany, denotes a ſoft woolly beard, on which the ſeeds of ſome plants, as millet, reeds, &c. hang.

PANICUM, in botany, a genus of the triandria digynia claſs. The calix conſiſts of three valves, the inmoſt of which is leaſt. There are 28 ſpecies, four of which are natives of Britain, *viz.* the viride, or green panic-graſs; the cruſgalli, or looſe panic-graſs; the ſanguinale, or cock's-foot panic-graſs; and the dactylon, or creeping panic graſs.

PANNEL, in law, ſignifies the priſoner at the bar, or perſon who takes his trial before the court of juſticiary, for ſome crime. See LAW, Tit. xxxiii. 47.

PANNELS *of a ſaddle*, are two cuſhions or bolſters, filled with cow's, deer's, or horſe-hair, and placed under the ſaddle, on each ſide, to prevent the bows and bands from galling the horſe.

PANNICULUS CARNOSUS, in comparative anatomy, a robuſt fleſhy tunic, ſituated in beaſts, between the tunic and the fat; by means of which they can move their ſkin in whole or part: it is altogether wanting in mankind.

PANORPA, the SCORPION-FLY, in zoology, a genus of inſects belonging to the order of neuroptera. The roſtrum is horny and cylindrical; there are two pappi, and three ſtemonata; the feelers are longer than the thorax; and the tail of the male is furniſhed with a forceps. There are four ſpecies, diſtinguiſhed by the colour and ſhape of their wings.

PANTALOON,

PANTALOON, a ſort of garment, conſiſting of breeches and ſtockings all of one piece; ſaid to have been firſt introduced by the Venetians.

PANTHEON, in Roman antiquity, a temple of a circular form, dedicated to all the gods: It was built by Agrippa, ſon-in-law to Auguſtus; but is now converted into a church, and dedicated to the Virgin and all the martyrs.

PANTHER, in zoology. See Leo.

PANTOMIME, a perſon who imitates all ſorts of actions and characters, by mere geſtures, without ſpeaking a word.

PANUCO, a city of Mexico, ſituated at the mouth of a river of the ſame name, and which falls into the gulph of Mexico: W. long. 103°, and N. lat. 23°.

PAPAVER, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of four petals, and the calix of two leaves. There are nine ſpecies, ſix of them natives of Britain, *viz.* the hybridum, or round rough-headed poppy; the cambricum, or yellow poppy; the ſomniferum, or wild poppy; the orgemone, or long rough-headed poppy; the rhœas, or red corn-poppy; and the dubium, or long ſmooth-headed poppy. For the medical properties of poppy, ſee Opium.

PAPENHEIM, a town of Franconia, in Germany, ſubject to its own count: E. long. 11°, N. lat. 48° 55′.

PAPER, ſheets of a thin matter, made of ſome vegetable ſubſtance.

The materials on which mankind have, in different ages, contrived to write their ſentiments, have been extremely various; in the early ages they made uſe of ſtones, and tables of wood, wax, ivory, *&c.* See Book.

Paper, with regard to the manner of making it, and the materials employed therein, is reducible to ſeveral kinds; as Egyptian paper, made of the ruſh papyrus; bark-paper, made of the inner rind of ſeveral trees; cotton paper; incombuſtable paper; and European paper, made of linen rags.

Egyptian paper was principally uſed among the ancients; being made of the papyrus, or biblus, a ſpecies of ruſh which grew on the banks of the Nile In making it into paper, they began with lopping off the two extremes of the plant, the head and the root; the remaining part, which was the ſtem, they cut lengthwiſe into two nearly equal parts, and from each of theſe they ſtripped the ſcaly pellicles of which it conſiſted. The innermoſt of theſe pellicles were looked on as the beſt, and that neareſt the rind as the worſt: they were therefore kept apart, and made to conſtitute two different ſorts of paper. As the pellicles were taken off, they extended them on a table, laying them over each other tranſverſely, ſo as that the fibres made right angles: in this ſtate they were glued together by the muddy waters of the Nile; or, when thoſe were not to be had, with paſte made of the fineſt wheat-flour, mixed with hot water and a ſprinkling of vinegar. The pellicles were next preſſed to get out the water, then dried, and laſtly flatted and ſmoothed by beating them with a mallet: this was the Egyptian paper, which was ſometimes farther poliſhed by rubbing it with a glaſs-ball, or the like.

Bark-paper was only the inner whitiſh rind, incloſed between the bark and the wood of ſeveral trees, as the maple, plane, beech, and elm, but eſpecially the tilia, or linden-tree, which was that moſtly uſed for this purpoſe. On this ſtripped off, flatted, and dried, the ancients wrote books, ſeveral of which are ſaid to be ſtill extant.

Chineſe paper is of various kinds. Some is made of the rinds or barks of trees, eſpecially the mulberry-tree and elm, but chiefly of the bambu and cotton-tree. In fact, almoſt each province has its ſeveral paper. The preparations of paper made of the barks of trees, may be inſtanced in that of the bambu, which is a tree of the cane or reed kind. The ſecond ſkin of the bark, which is ſoft and white, is ordinarily made uſe of for paper: this is beat in fair water to a pulp, which they take up in large moulds, ſo that ſome ſheets are above twelve feet in length; they are completed, by dipping them ſheet by ſheet, in alum-water, which ſerves inſtead of the ſize among us, and not only hinders the paper from imbibing the ink, but makes it look as if varniſhed over. This paper is white, ſoft, and cloſe, without the leaſt roughneſs; though it cracks more eaſily than European paper, is very ſubject to be eaten by the worms, and its thinneſs makes it liable to be ſoon worn out.

Cotton-paper is a ſort of paper which has been in uſe upwards of ſix hundred years. In the French king's library are manuſcripts on this paper, which appear to be of the Xth century; and from the XIIth century, cotton manuſcripts are more frequent than parchment ones. Cotton-paper is ſtill made in the Eaſt-Indies, by beating cotton rags to a pulp.

Linen or European paper appears to have been firſt introduced among us towards the beginning of the XIVth century; but by whom this valuable commodity was invented, is not known. The method of making paper of linen or hempen-rags, is as follows. The linen-rags being carried to the mill, are firſt ſorted, then waſhed very clean in puncheons, whoſe ſides are grated with ſtrong wires, and the bottoms bored full of holes. After this they are fermented, by laying them in heaps cloſe covered with ſacking, till they ſweat and rot, which is commonly done in four or five days. When duly fermented, they are twiſted into handfuls, cut ſmall, and thrown into oval mortars, made of well-ſeaſoned oak, about half a yard deep, with an iron-plate at bottom, an inch thick, eight inches broad, and thirty long; in the middle is a waſhing-block, grooved, with five holes in it, and a piece of hair-ſieve faſtened on the inſide; this keeps the hammers from touching it, and prevents any thing going out except the foul water. Theſe mortars are continually ſupplied with water, by little troughs from a ciſtern, fed by buckets fixed to the ſeveral floats of a great wheel, which raiſes the wooden hammers for pounding the rags in the mortars. When the rags are beaten to a certain degree, called the firſt ſtuff, the pulp is removed into boxes, made like corn-chandlers bins, with the bottom-board aſlant, and a little ſeparation on the front for the water to drain away. The pulp of the rags being in, they take away as many of the front boards as are needful, and preſs the maſs hard down with their hands; the next day they put on another board, and add more pulp, till the box is full; and here it remains mellowing a week, more or leſs, according to the weather. After this, the ſtuff is again put into clean mortars, and is beaten afreſh, and removed into boxes, as before, in which ſtate it is called the ſecond ſtuff. The maſs is beat a third time, till ſome of it being mixed with fair water, and brewed to and fro, appears

appears like flour and water, without any lumps in it: it is then fit for the pit-mortar, where it is perfectly diſſolved, and is then carried to the vat, to be formed into ſheets of paper. But lately, inſtead of pounding the rags to a pulp with large hammers, as above, they make uſe of an engine, which performs the work in much leſs time. This engine conſiſts of a round ſolid piece of wood, into which are faſtened ſeveral long pieces of ſteel, ground very ſharp. This is placed in a large trough with the rags, and a ſufficient quantity of water. At the bottom of the trough is a plate with ſteel bars, ground ſharp like the former; and the engine being carried round with prodigious velocity, reduces the rags to a pulp in a very ſhort time. It muſt be obſerved, that the motion of the engine cauſes the water in the trough to circulate, and by that means conſtantly returns the ſtuff to the engine. The trough is conſtantly fed with clean water at one end, while the dirty water from the rags is carried of at the other, through a hole, defended with wire gratings, in order to hinder the pulp from going out with the dirty water.

When the ſtuff is ſufficiently prepared as above, it is carried to the vat, and mixed with a proper quantity of water, which they call priming the vat. The vat is rightly primed, when the liquor has ſuch a proportion of the pulp, as that the mould, on being dipped into it, will juſt take up enough to make a ſheet of paper of the thickneſs required. The mould is a kind of ſieve exactly of the ſize of the paper to be made, and about an inch deep, the bottom being formed of fine braſs wire, guarded underneath with ſticks, to prevent it bagging down, and to keep it horizontal; and further, to ſtrengthen the bottom, there are large wires placed in parallel lines, at equal diſtances, which form thoſe lines viſible in all white paper when held up to the light: the mark of the paper is alſo made in this bottom, by interweaving a large wire in any particular form. This mould the maker dips into the liquor, and gives it a ſhake as he takes it out, to clear the water from the pulp. He then ſlides it along a groove to the coucher, who turns out the ſheet upon a felt laid on a plank, and lays another felt on it; and returns the mould to the maker, who by this time has prepared a ſecond ſheet in another mould: and thus they proceed, laying alternately a ſheet and a felt, till they have made ſix quires of paper, which is called a poſt; and this they do, with ſuch ſwiftneſs, that, in many ſorts of paper, two men make twenty poſts or more in a day. A poſt of paper being made, either the maker or coucher whiſtles; on which four or five men advance, one of whom draws it under the preſs, and the reſt preſs it with great force, till all the water is ſqueezed from it; after which it is ſeparated ſheet by ſheet from the felts, and laid regularly one ſheet upon another; and having undergone a ſecond preſſing, it is hung up to dry. When ſufficiently dried, it is taken off the lines, rubbed ſmooth with the hands, and laid by till ſized, which is the next operation. For this they chuſe a fine temperate day; and having boiled a proper quantity of clean parchment, or vellum ſhavings, in water, till it comes to a ſize, they prepare a fine cloth, on which they ſtrew a due proportion of white vitriol and roch-alum finely powdered, and ſtrain the ſize through it into a large tub; in which they dip as much paper at once as they can conveniently hold, and with a quick motion give every ſheet its ſhare of the ſize, which muſt be as hot as the hand can well bear it. After this, the paper is preſſed, hung up ſheet by ſheet to dry; and being taken down, is ſorted, and what is only fit for outſide-quires laid by themſelves: it is then told into quires, which are folded and preſſed. The broken ſheets are commonly put together, and two of the worſt quires are placed on the outſide of every ream or bundle; and being tied up in wrappers, made of the ſettling of the vat, it is fit for ſale.

Paper is of various kinds, and uſed for various purpoſes: with regard to colour, it is principally diſtinguiſhed into white, blue, and brown; and with regard to its dimenſions, into atlas, elephant, imperial, ſuper-royal, royal, medium, demy, crown, foolſcap, and pot-paper.

PAPER-OFFICE, an office in the palace of Whitehall, in which all the public writings, matters of ſtate and council, proclamations, letters, intelligences, negotiations abroad, and generally all diſpaches that paſs through the offices of the ſecretaries of ſtate, are lodged, by way of library.

PAPHLAGONIA, an ancient province of the leſſer Aſia, ſituated on the Euxine-ſea, now part of the province of Amaſia in Turky.

PAPHOS, once an elegant city at the weſt end of the iſland of Cyprus; but the little town of Baffo is now all that remains of it.

PAPILIO, the BUTTERFLY, in zoology, a genus of inſects belonging to the order of lepidoptera. It has four wings, imbricated with a kind of downy ſcales; the tongue is convoluted in a ſpiral form; and the body is hairy. There are 273 ſpecies, principally diſtinguiſhed by the colour of their wings.

PAPILIONACEOUS, among botaniſts, an appellation given to the flowers of plants belonging principally to the diadelphia claſs; from their reſembling the figure of a butterfly.

PAPOUS, or NEW GUINEA, a large continent in the Pacific ocean, a little ſouth of the equator; ſituated eaſt of the Spice iſlands, in 130° eaſt long. but how far it extends farther to the eaſtward or ſouthward, is uncertain.

PAPPUS, in botany, a ſoft downy ſubſtance, that grows on the ſeeds of certain plants, as thiſtles, hawkweed, *&c.* ſerving to ſcatter and buoy them up in the air.

PAR, in commerce, ſignifies any two things equal in value. See COMMERCE.

PARABLE, a fable, or allegorical inſtruction, founded on ſomething real or apparent in nature or hiſtory, from which a moral is drawn, by comparing it with ſomething in which the people are more immediately concerned; ſuch are the parables of Dives and Lazarus, of the Prodigal Son, of the Ten Virgins, *&c.*

PARABOLA. See CONIC SECTIONS.

PARACENTESIS, an operation in ſurgery, commonly called tapping. See SURGERY.

PARACLET, the COMFORTER, a name given to the Holy Ghoſt.

PARADISEA, in ornithology, a genus belonging to the order of picæ. The beak is covered with a belt or collar of downy feathers at the baſe; and the feathers on the ſides are very long. There are three ſpecies, *viz.* 1. The apoda, has the feathers on the ſides longer than the body, and two long briſtly feathers in the tail. It is the greater bird of paradiſe, and feeds upon butterflies. They are

are found in large flocks in the Molucca islands. 2. The regia, has two intermediate prime tail-feathers like threads and feathery at the points. It is found in Amboina. 3. The tristis, has a naked triangular spot behind the eyes; and the head and neck are of a dusky colour. It is a native of the Philippine isles, and feeds upon grass-hoppers and other insects.

PARADISE, a term principally used for the garden of Eden, in which Adam and Eve were placed immediately upon their creation.

As to this terrestrial paradise, there have been many inquiries about its situation. It has been placed in the third heaven, in the orb of the moon, in the moon itself, in the middle region of the air, above the earth, under the earth, in the place possessed by the Caspian sea, and under the arctic pole. The learned Huetius places it upon the river that is produced by the conjunction of the Tigris and Euphrates, now called the river of the Arabs, between this conjunction and the division made by the same river before it falls into the Persian sea. Other geographers have placed it in Armenia, between the sources of the Tigris, the Euphrates, the Araxis, and the Phasis, which they suppose to be the four rivers described by Moses.

The celestial paradise is that place of pure and refined delight, in which the souls of the blessed enjoy everlasting happiness.

Bird of PARADISE. See PARADISEA.

PARADOX, in philosophy, a proposition seemingly absurd, as being contrary to some received opinion, but yet true in fact.

No science abounds more with paradoxes than geometry: thus, that a right line should continually approach to the hyperbola, and yet never reach it, is a true paradox; and in the same manner, a spiral may continually approach to a point, and yet not reach it, in any number of revolutions, however great.

PARÆA, in zoloogy. See COLUBER.

PARAGOGE, in grammar, a figure whereby a letter or syllable is added to the end of a word; as *med*, for *me; dicier*, for *dici*, &c.

PARAGUAY, or LA PLATA, a province of South America, subject to Spain, lies between 12° and 37° S. lat. and between 50° and 75° W. long.

PARALIPOMENA, in matters of literature, denotes a supplement of things omitted in a preceding work.

PARALLACTIC, in general, something relating to the parallax of heavenly bodies. See PARALLAX.

PARALLAX, in astronomy. See ASTRONOMY, p. 452.

PARALLEL, in geometry, an appellation given to lines, surfaces, and bodies every where equidistant from each other. See GEOMETRY.

PARALLELS *of latitude*, in astronomy, are lesser circles of the sphere parallel to the ecliptic, imagined to pass through every degree and minute of the colures.

PARALLELS *of altitude*, or ALMUCANTARS, are circles parallel to the horizon, imagined to pass through every degree and minute of the meridian between the horizon and zenith, having their poles in the zenith.

PARALLELS *of declination*, in astronomy, are the same with parallels of latitude in geography.

PARALLEL SPHERE, that situation of the sphere, wherein the equator coincides with the horizon, and the poles with the zenith and nadir.

PARALLEL SAILING. See NAVIGATION.

PARALLELOPIPED, in geometry, a regular solid comprehended under six parallelograms, the opposite ones whereof are similar, parallel, and equal.

PARALLELOGRAM, in geometry, a quadrilateral right-lined figure, whose opposite sides are parallel and equal to each other.

PARALLELOPIPEDIA, in natural history, the name of a genus of spars, thus called, because regularly of a parallelopiped form.

They are pellucid crystalline spars externally of a determinate and regular figure, always found loose, detached, and separate from all other bodies, and in form of an oblique parallelopiped, with six parallelogram sides and eight solid angles, easily fissile either in an horrizontal or perpendicular direction, being composed of numbers of thin plates, and those of very elegantly and regularly arranged bodies, each of the same form with the whole mass, except that they are thinner in proportion to their horizontal planes; and naturally fall into these and no other figures, on being broken with a slight blow.

PARALOGISM, in logic, a false reasoning, or a fault committed in demonstration, when a consequence is drawn from principles that are false, or, though true, are not proved; or when a proposition is passed over that should have been proved by the way.

PARALYSIS, the PALSY. See MEDICINE, p. 97.

PARAMECIA, in natural history, a name given to such animalcules as have no visible limbs or tails, and are of an irregularly oblong figure.

PARAMETER, in conic sections, a constant line, otherwise called latus rectum. See CONIC SECTIONS.

PARAMOUNT, in law, signifies the supreme lord of the fee.

PARANYMPH, among the ancients, the person who waited on the bridegroom, and directed the nuptial solemnities; called also pronubus, and auspex, because the ceremonies began by taking auspicia. As the paranymph officiated only on the part of the bridegroom, a woman called pronuba officiated on the part of the bride.

PARAPET, in fortification, an elevation of earth designed for covering the soldiers from the enemies cannon or small shot. See FORTIFICATION.

PARAPHERNAL *goods* in Scots law. See LAW, Tit. vi. 8.

PARAPHIMOSIS, in medicine, a disorder in the penis, wherein the prepuce is shrunk, and withdrawn behind the glans, so as not to be capable of being brought to cover the same; which generally happens in venereal disorders. See MEDICINE.

PARAPHRASE, an explanation of some text, in clearer and more ample terms, whereby is supplied what the author might have said or thought on the subject; such are esteemed Erasmus's paraphrase on the New Testament, the Chaldee paraphrase on the Pentateuch, *&c.*

PARAPHRENITIS, in medicine, an inflammation of the diaphragm. See MEDICINE.

PARAPHROSYNE, a word used by medical writers to express a delirium, or an alienation of mind in fevers, or from whatever cause.

PARAPLEGIA, a species of palsy. See MEDICINE. p. 97

PARASELENE, in physiology, a mock moon, a meteor, or phænomenon, encompassing, or adjacent to, the moon, in form of a luminous ring; wherein are sometimes observed one, sometimes two, apparent images of the moon.

PARASITE, among the Greeks, was originally a very reputable title; the parasites being a kind of priests, at least ministers, of the gods, in the same manner as the Epulones were at Rome. They took care of the sacred corn, or the corn destined for the service of the temples, and the gods, *viz.* sacrifices, feasts, *&c.* they had even the intendance over sacrifices, and took care that they were duly performed. At Athens, there was a kind of college of twelve parasites; each people of Attica furnishing one, who was always chosen out of the best families. Polybius adds, that a parasite was also an honourable title among the ancient Gauls, and was given to their poets; but of late it has been made a term of reproach, and used for a flatterer and mean dependant.

PARASITES, or PARASITICAL PLANTS, in botany, such plants as are produced out of the trunk or branches of other plants, from whence they receive their nourishment, and will not grow upon the ground, as the misleto, *&c.*

PARASTATÆ, in anatomy. See ANATOMY, p. 270.

PARASYNANCHE, in medicine, a kind of angina, or quinsey. See MEDICINE, p. 84.

PARATHENAR, in anatomy. See ANAT. p. 212.

PARBUNCLE, in a ship, the name of a rope almost like a pair of slings: it is seized both ends together, and then put double about any heavy thing that is to be hoisted in or out of the ship; having the hook of the runner hitched into it, to hoise it up by.

PARCÆ, in the heathen mythology, goddesses, who were supposed to preside over the accidents and events, and to determine the date or period, of human life. See MYTHOLOGY.

PARCHMENT, the skins of sheep or goats prepared after such a manner as to render it proper for writing upon, covering books, *&c.*

The manufacture of parchment is begun by the skinner, and finished by the parchment-maker.

The skin having been stripped of its wool, and placed in the lime pit, the skinner stretches it on a kind of frame, and pares off the flesh with an iron instrument: this done, it is moistened with a rag; and powdered chalk being spread over it, the skinner takes a large pumice-stone, flat at bottom, and rubs over the skin, and thus scowers off the flesh: he then goes over it again with the iron instrument, moistens it as before, and rubs it again with the pumice-stone without any chalk underneath: this smooths and softens the flesh-side very considerably. He then drains it again, by passing over it the iron instrument as before. The flesh-side being thus drained, by scraping off the moisture, he in the same manner passes the iron over the wool or hair side: then stretches it tight on a frame, and scrapes the flesh side again: this finishes its draining; and the more it is drained, the whiter it becomes. The skinner now throws on more chalk, sweeping it over with a piece of lamb skin that has the wool on; and this smooths it still farther. It is now left to dry; and when dried, taken off the frame, by cutting it all round. The skin, thus far prepared by the skinner, is taken out of his hands by the parchment-maker; who first, while it is dry, pares it on a summer (which is a calf-skin stretched in a frame) with a sharper instrument than that used by the skinner, and, working with the arm from the top to the bottom of the skin, takes away about one half of its thickness. The skin, thus equally pared on the flesh-side, is again rendered smooth, by being rubbed with the pumice-stone on a bench covered with a sack stuffed with flocks, which leaves the parchment in a condition fit for writing upon. The parings thus taken off the leather, are used in making glue, size, *&c.*

What is called vellum, is only parchment made of the skins of abortives, or at least sucking calves. This has a much finer grain, and is whiter and smoother than parchment; but is prepared in the same manner, except its not being passed through the lime-pit.

PARDALUS. See LEO.

PAREGORICS in pharmacy, medicines that asswage pain, otherwise called anodynes.

PAREIRA BRAVA, in the materia medica, a kind of oblong and large root, brought from the Brasils.

It is certainly a diuretic of no mean character, and has done great service in nephritic cases; and in pleurisies and quinseys it has been attended with more success than almost any medicine we know of singly.

PARELCON, in grammar, a figure by which a word or syllable is added to the end of another.

PAREMBOLE, in rhetoric, a figure wherein something relating to the subject is inserted in the middle of a period. All the differences between the parembole and parenthesis, according to Vossius, is, that the former relates to the subject in hand, whereas the latter is foreign to it.

PARENCHYMA, in anatomy, a term introduced by Erasistratus, signifying all that substance which is contained in the interstices betwixt the blood-vessels of the viscera, which he imagined to be extravasated and concreted blood.

PARENCHYMA *of plants*. Grew applies the term parenchyma to the pith or pulp, or that inner part of a fruit or plant through which the juice is supposed to be distributed. See AGRICULTURE.

PARENT, a term of relation applicable to those from whom we immediately receive our being.

PARENTALIA, in antiquity, funeral obsequies, or the last duties paid by children to their deceased parents.

PARENTHESIS, in grammar, certain intercalary words, inserted in a discourse, which interrupt the sense, or thread, but seem necessary for the better understanding of the subject.

PARENZO, or PIRENZO, a port-town of Istria, in the territory of Venice, situated on a bay of the gulph of Venice, twenty-five miles south of Cabo de Istria.

PARESIS, in medicine, is defined to be a palsy of the bladder, wherein the urine is either suppressed, or discharged involuntarily.

PARETONIUM, in natural history, the name of an earth anciently found on the shores of Egypt, Cyrene, and the island of Crete, and used by the ancients in painting.

PARGET, in natural history, a name given to several kinds of gypsum, or plaster-stone.

PARGETING, in building, is used for the plastering of walls, and sometimes for plaster itself.

PAR-

PARHELIUM, or PARHELION, in phyſiology, a mock ſun, or meteor, in form of a very bright light, appearing on one ſide of the ſun.

The parhelia are formed by the reflection of the ſun's beams on a cloud properly poſited. They uſually accompany the coronæ, or luminous circles, and are placed in the ſame circumference and at the ſame height. Their colours reſemble that of the rainbow, the red and yellow are on the ſide towards the ſun, and the blue and violet on the other. There are coronæ ſometimes ſeen without parhelia, and *vice verſa*.

Parhelia are double, triple, *&c.* and in 1629 a parhelion of five ſuns was ſeen at Rome, and in 1666 another at Arles of ſix.

M. Mariotte accounts for parhelia from an infinity of little particles of ice floating in the air, that multiply the image of the ſun by refraction or reflection; and by a geometrical calculus he has determined the preciſe figure of theſe little icicles, their ſituation in the air, and the ſize of the coronæ of circles which accompany the parhelia, and the colours wherewith they are painted.

PARIA, a lake of Peru, in South America, in the province of Los Charcas, ſituated in 67° W. long. and 22° S. lat.

PARIETALIA OSSA, in anatomy. See ANATOMY, p. 154.

PARIETARIA, in botany, a genus of the polygamia monœcia claſs. The calix, both in the female and hermaphrodite, conſiſts of four ſegments; none of them have any corolla; the hermaphrodite has four ſtamina; and both have one ſtylus, and one long ſeed. There are ſix ſpecies, only one of them, *viz.* the officinalis, or pellitory of the wall, is a native of Britain. It is eſteemed as cooling and abſtergent.

PARIS, in botany, a genus of the octandria trigynia claſs. The calix conſiſts of four leaves, and the corolla of four narrow petals; and the berry has four cells. There is but one ſpecies, *viz.* the quadrifolia, herb-paris, or true-love, a native of Britain.

PARIS, in geography, the metropolis of the kingdom of France, and of the principality or government of the iſle of France, ſituated in E. long. 2° 25′, N. lat 48° 50′, two hundred miles ſouth-eaſt of London, ſix hundred and eighty north-eaſt of Madrid, five hundred and fifty weſt of Vienna, one thouſand three hundred north-weſt of Conſtantinople, and ſeven hundred north-weſt of Rome.

PARISH, the precinct of a parochial church, or a circuit of ground inhabited by people who belong to one church and are under the particular charge of its miniſter.

PARK, a large incloſure privileged for wild beaſts of chace, either by preſcription or the king's grant.

PARKINSONIA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of four ſegments, and the corolla of four oval petals, the loweſt being kidney-ſhaped; it has no ſtylus; and the pod is cylindrical.

PARLEY, a conference with an enemy. Hence to beat or ſound a parley, is to give a ſignal for holding ſuch a conference by beat of drum or ſound of trumpet.

PARLIAMENT, is the grand aſſembly of the three ſtates of this kingdom, ſummoned together, by the king's authority, to conſult of matters relating to the public welfare, and particularly to enact and repeal laws. It conſiſts of the king, the lords ſpiritual and temporal, and the commons, and is at once the ſeat of the legiſlative authority, and the higheſt court of juſtice in Great Britain. In the houſe of lords, criminal cauſes are tried on the impeachment of the commons; and this houſe has an original juriſdiction for the trial of peers upon indictments found by a grand jury; the lords likewiſe try ſuch cauſes as come thither on appeals from the court of chancery, and all their decrees are as judgments. The houſe of commons examine the right of elections; regulate diſputes concerning them; may expel their own members, and commit them to priſon. They are the grand inqueſt of the nation; and preſent public grievances or delinquents to the king and lords, in order to their being puniſhed. In ſhort, they are the repreſentatives of all the commons in the kingdom; and in them their conſtituents have placed the higheſt confidence, by inveſting them with the power of making laws, and entruſting them with all their liberties and privileges.

Originally, new parliaments were called every year; but by degrees their term grew longer. In the reign of king Charles II. they were held a long time, with great interruptions between: but both methods were found of ſuch ill conſequence, that, in the beginning of the reign of king William III. an act was paſſed, by which the term of all parliaments was reſtrained to three ſeſſions, or three years; this was hence called the triennial act: but ſince that time, from other views, the period of parliaments has been lengthened to ſeven years. A parliament is called by the king's writ or letter directed to each lord, commanding him to appear; and by other writs, directed to the ſheriffs of each county, to ſummon the people to elect two knights for each county, and one or two burgeſſes for each borough. The number of the members in the houſe of lords is uncertain, as increaſing at the king's pleaſure. The members of the houſe of commons, when full, are five hundred and fifty-three; *viz.* ninety-two knights of the ſhires; fifty-two deputies for twenty-five cities, London having four; ſixteen for the eight cinque-ports; two for each univerſity; three hundred and thirty-two for an hundred and eighty boroughs; twelve for the boroughs in Wales, and forty-five members for Scotland. If three hundred of theſe members are met, it is reckoned a full houſe; and forty may compoſe a houſe for the diſpatch of buſineſs.

Upon the holding of a parliament, the king, the firſt day, ſits in the upper-houſe, under a canopy, with the crown on his head, and dreſſed in his royal robes; and there, by himſelf, or the lord chancellor, declares the reaſons of their meeting, in the preſence of both the lords and commons; and then the commons are required to chuſe a ſpeaker, who is preſented to the king, and being approved by his majeſty, the buſineſs of the parliament goes on.

The lords and commons ſit each in a diſtinct apartment: in the houſe of lords, the princes of the blood ſit by themſelves on the ſides of the throne; at the wall, on the king's right hand, the two archbiſhops ſit by themſelves on a form. Below them, the biſhops of London, Durham, and Wincheſter, and all the other biſhops, ſit according to the priority of their conſecration. On the king's left hand the lord-treaſurer, lord preſident, and lord privy-ſeal, ſit upon forms above all dukes, except the royal blood; then the dukes, marquiſſes, and earls, according

cording to their creation. A-crofs the room are wool-facks, continued from an ancient cuftom; and the chancellor, or keeper, being of courfe the fpeaker of the houfe of lords, fits on the firft wool-fack before the throne, with the great feal or mace lying by him; below thefe are forms for the vifcounts and barons. On the other wool facks are feated the judges, mafters in chancery, and king's council, who are only to give their advice in points of law: but they all ftand up till the king gives them leave to fit. The commons fit promifcuoufly; only the fpeaker has a chair at the upper end of the houfe, and the clerk and his affiftant fit at a table near him. Before any bufinefs is done, all the members of the houfe of commons take the oaths of allegiance and fupremacy, *&c.* and fubfcribe their opinions againft tranfubftantiation, *&c.* and if any member of that houfe votes, or fits there during any debate, after the fpeaker is chofen, without having firft taken thefe oaths, between the hours of nine and four, in a full houfe, he is adjudged a Popifh recufant convict, and incapable of any office, and forfeits five hundred pounds. The fame teft the lords too, though they do not take the oaths, are obliged to comply with. When the parliament is thus met, no members are to depart from it without leave. Upon extraordinary occafions, all the members are fometimes fummoned; in which cafe every lord fpiritual and temporal, and every knight, citizen, and burgefs, is to come to parliament, except he can reafonably and honeftly excufe himfelf; or be amerced; that is, refpectively, a lord by the lords, and a commoner by the commons.

All members of parliament, in order that they may attend the public fervice of their country, have the privilege for themfelves of being free from arrefts, attachments, imprifonment, *&c.* for debts, trefpaffes, *&c.* but not from arrefts for treafon, felony, and breach of the peace.

As to the election of members, it is enacted, That candidates fhall not make any prefents of money to, or treat the electors, after the teft of the writ of the fummons, or the iffuing out of the writs for elections, or after any feat for a member of parliament is become vacant; in cafe they do, they are declared incapable of ferving as members, by 7 W. III. c. 4. And farther, an oath is to be taken by electors, That they have not either received, or had any money, gift, reward, or any office, place, employment, or even promife of money, gift, *&c.* to them or their ufe, to give their votes; and in thefe cafes, if they afk, take, or contract for money or reward, either by gift or other device, to give or refufe their votes for any one; or if perfons, by gift, *&c.* corruptly procure any elector to give his vote; they fhall forfeit five hundred pounds, and be totally difabled to vote at any election of members of parliament, as alfo to hold any office, franchife, *&c.* Likewife officers who admit perfons to vote without their taking the aforementioned oath, in cafe the fame be demanded, incur a forfeiture of one hundred pounds; and an oath is to be adminiftred to all the returning officers, that they have not received any money, gift, or place, for the making of their returns: 2 Geo. II. c. 24. 9 Geo. II. c. 38. A knight of the fhire muft be worth fix hundred pounds a-year in land, and all other members three hundred pounds.

Anciently all the people had votes in elections, till it was enacted by Henry VI. that none but freeholders, who had a yearly revenue of forty fhillings, fhould be admitted to vote for knights of the fhire.

The manner of debating upon, and paffing bills in parliament, is as follows: Any member may move to have a bill brought in, which, upon a queftion put, being agreed to by the majority, this perfon, with others, is ordered to prepare and bring in the fame. When it is ready, a time is appointed for its being read; and after the clerk's reading it, the fpeaker reads an abftract of it, and puts the queftion whether or no it fhall have a fecond reading; and after a fecond reading, the queftion is put whether or no it fhall be committed, which is either to a commitee of the whole houfe if it be of importance, or to a private commitee, any member naming the perfons. The committee being appointed, and a chairman chofen, the chairman reads the bill paragraph by paragraph, puts every claufe to the queftion, fills up the blanks, and makes amendments, according to the opinion of the majority. The bill thus gone through, the chair-man makes his report at the fide-bar of the houfe, reads all the additions and amendments, *&c.* and moves for leave to bring up the report to the table; which granted, he delivers it to the clerk, who reads the amendments, *&c.* The fpeaker then puts the queftion whether they fhall be read a fecond time; and, if agreed to, he reads them himfelf. To fo many of the amendments as the houfe acquiefces in, the queftion is now put, Whether the bill, thus amended, fhall be ingroffed and written fair upon parchment, and read a third time? and the bill being ingroffed, the fpeaker holds it in his hand, and afks if it fhall pafs. If the majority be for it, the clerk writes on it, *Soit baille aux feigneurs*, "Let it be delivered to the lords;" or if in the houfe of lords, *Soit baille aux communes*, "Let it be delivered to the commons." If a bill be rejected, it cannot be any more propofed during that feffion. A bill for a general pardon has but one reading.

When a member of the houfe of commons fpeaks, he ftands up uncovered, and directs his fpeech to the fpeaker only. If what he fays be anfwered by another, he is not allowed to reply the fame day, unlefs perfonal reflections have been caft upon him: but when the commons, in order to have a greater freedom of debate, have refolved themfelves into a comittee of the whole houfe, every member may fpeak to a queftion as often as he thinks neceffary. In the houfe of lords they vote, beginning at the puifne, or loweft baron and fo up orderly to the higheft, every one anfwering *Content* or *Not content*. In the houfe of commons they vote by *yeas* and *nays*; and if it be dubious which are the greater number, the houfe divides. If the queftion be about bringing any thing into the houfe, the *yeas* go out; but if it be about any thing the houfe already has, the *nays* go out. In all divifions the fpeaker appoints four tellers, two of each opinion. In a committee of the whole houfe, they divide by changing fides, the *yeas* taking the right and the *nays* the left of the chair; and then there are but two tellers. If a bill pafs one houfe, and the other demur to it, a conference is demanded in the painted chamber, where certain members are deputed from each houfe; and here the lords fit covered, and the commons ftand bare and debate the cafe. If they difagree, the affair is null; but if they agree,

gree, this, with the other bells that have paſſed both houſes, is brought down to the king in the houſe of lords, who comes thither cloathed in his royal robes; before him the clerk of the parliament reads the title of each bill, and as he reads, the clerk of the crown pronounces the royal aſſent or diſſent. If it be a public bill, the royal aſſent is given in theſe words, *Le roy le vaut*, "The king will have it ſo;" if private, *Soit fait comme il eſt deſiré*, "Let the requeſt be complied with:" if the king refuſes the bill, the anſwer is, *Le roy s'aviſera*, "The king will think of it;" and if it be a money-bill, the anſwer is, *Le roy remercie ſes loyaux ſujets, accepte leur benevolence, & auſſi le veut*; "The king thanks his loyal ſubjects, accepts their benevolence, and therefore grants his conſent."

PARLIAMENTS *of France*, are ſovereign courts, eſtabliſhed by the king, finally to determine all diſputes between particular perſons, and to pronounce on appeals from ſentences given by inferior judges. There are ten of theſe parliaments in France, of which that of Paris is the chief, its privileges and juriſdiction being of the greateſt extent. It conſiſts of ſix chambers, *viz.* the grand chamber, where cauſes of audience are pleaded; and five chambers of inqueſt, where proceſſes are adjudged in writing. This parliament enjoys the privileges of verifying and regiſtring the king's arrets or edicts, without which thoſe edicts are of little or no value.

PARLIAMENT *of Sweden*, conſiſts of four eſtates, with the king at their head: Theſe ſtates are, 1. The nobility and repreſentatives of the gentry; with whom the colonels, lieutenant-colonels, majors, and captains of every regiment, ſit and vote. 2. The clergy; one of which body is elected from every rural deanery of ten pariſhes; who, with the biſhops and ſuperintendants, amount to about two hundred. 3. The burghers, elected by the magiſtrates and council of every corporation as their repreſentatives, of whom there are four for Stockholm, and two for every other town, amounting in the whole to about an hundred and fifty. 4. The peaſants, choſen by the peaſants out of every diſtrict; who chuſe one of their own rank, and not a gentleman, to repreſent them: theſe amount to about two hundred and fifty.

All theſe generally meet at Stockholm; and after the ſtate-affairs have been repreſented to them from the throne, they ſeparate, and ſit in four ſeveral chambers or houſes, in each of which affairs are carried on by majority of votes; and every chamber has a negative in the paſſing any law.

PARMA, the capital of the duchy of Parma, in Italy, ſixty miles north-eaſt of Genoa, is pleaſantly ſituated on a river to which it gives name: E. long. 11°, N. lat. 44° 45′.

PARNASSIA, in botany, a genus of the pentandria tetragynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; it has five cordated nectaria, with round buttons on their points; and the capſule has four valves. There is but one ſpecies, *viz.* the paluſtris, or graſs of Parnaſſus, a native of Britain.

PARNASSUS, a mountain of Greece, much celebrated by ancient poets, ſituated near Caſtro in Livadia.

PARODY, a popular maxim, adage, or proverb.

Parody is alſo a poetical pleaſantry, conſiſting in applying the verſes written on one ſubject, by way of ridicule to another; or in turning a ſerious work into a burleſque, by affecting to obſerve, as nearly as poſſible, the ſame rhymes, words, and cadences.

PARONOMASIA, in rhetoric, a pun; or a figure whereby words nearly alike in ſound, but of very different meanings, are affectedly or deſignedly uſed.

PAROS, one of the ſmalleſt iſlands of the Cyclades, famous for its marble, ſituated in E. long. 25° 30′, N. lat. 36° 30′.

PAROTIDES, in anatomy. See ANATOMY, p. 270.

PAROXYSM, in medicine, the ſevere fit of a diſeaſe, under which it grows higher, or exaſperates, as of the gout, &c.

PARRELS, in a ſhip, are frames made of trucks, ribs, and ropes, which having both their ends faſtened to the yards, are ſo contrived, as to go round about the maſts; that the yards, by their means, may go up and down upon the maſt; theſe alſo, with the breaſt-ropes, faſten the yards to the maſts.

PARRICIDE. See LAW, Tit. xxxiii. 19.

PARROT, in ornithology. See PSITTACUS.

PARSLEY, in botany. See APIUM.

PARSNEP, in botany. See PASTINACA.

PARSON, the rector or incumbent of a pariſh-church.

PARSONAGE, a rectory or pariſh-church, endowed with a houſe, glebe, lands, tithes, &c. for the maintenance of a miniſter, with cure of ſouls within ſuch pariſh.

PARTS *of ſpeech*, in grammar, are all the ſorts of words which enter the compoſition of diſcourſe. See GRAMMAR.

PARTERRE, in gardening, a level diviſion of ground, which, for the moſt part, faces the ſouth and beſt front of an houſe; and is generally furniſhed with greens, flowers, &c.

PARTHENIUM, in botany, a genus of the monœcia pentandria claſs. The common calix of the male conſiſts of five leaves; and the corolla of the diſh are monopetalous. The corollæ of the radius in the female are five; two of each ſide are males, and the intermediate one female, above a naked ſeed. There are two ſpecies, none of them natives of Britain.

PARTHIA, a country of Aſia, formerly ſo called, ſituated almoſt in the middle of the modern Perſia.

PARTI, PARTIE, PARTY, or PARTED, in heraldry, is applied to a ſhield or eſcutcheon, denoting it divided or marked out into partitions.

Parti per pale is when the ſhield is divided perpendicularly into two halves, by a cut in the middle from top to bottom. See Plate CXXXIV. fig. 11.

Parti per feſs is when the cut is acroſs the middle, from ſide to ſide.

Parti per bend dexter, is when the cut comes from the upper corner of the ſhield, on the right hand, and deſcends athwart to the oppoſite lower corner.

Parti per bend ſiniſter, is when the cut, coming from the upper left corner, deſcends acroſs to the oppoſite lower one.

From theſe four partitions have proceeded an infinite number of others, of various and extravagant forms.

PARTICIPLE, in grammar, an adjective formed of a verb, ſo called becauſe it participates partly of the properties of a noun, and partly of thoſe of a verb. See GRAMMAR.

PARTICLE, in phyſiology, the minute part of a body, an

an aſſemblage of which conſtitute all natural bodies.

It is the various arrangement and texture of theſe particles, with the difference of coheſion, *&c.* that conſtitute the various kinds of bodies. The ſmalleſt particles cohere with the ſtrongeſt attraction, and compoſe bigger particles of weaker coheſion; and many of theſe cohering compoſe bigger particles, whoſe vigour is ſtill weaker; and hereupon the operations in chemiſtry, and the colours of natural bodies, depend, and which, by cohering, compoſe bodies of ſenſible bulk. The coheſion of the particles of matter, the Epicureans imagined, was effected by means of hooked atoms; the Ariſtotelians, by reſt; but Sir Iſaac Newton ſhews, that it is done by means of a certain power, whereby the particles mutually attract and tend towards each other. By this attraction of the particles, he ſhews, that moſt of the phænomena of the leſſer bodies are affected, as thoſe of the heavenly bodies are, by the attraction of gravity.

PARTICLE, in grammar, a denomination for all thoſe ſmall words that tie or untie others together, or that expreſs the modes or manners of words. See GRAMMAR.

PARTNER, and PARTNERSHIP. See ARITHMETIC, p. 386.

PARTRIDGE, in ornithology. See TETRAO.

PARTURITION. See DELIVERY.

PARULIDES, in ſurgery, tumours and inflammations of the gums, commonly called gum-boils.

They are to be treated with diſcutients, like other inflammatory tumours.

PARUS, in ornithology. See CERTHIA.

PASCHAL, ſomething belonging to the paſſover or eaſter. See PASSOVER, and EASTER.

PAISLEY, a town of Scotland, in the county of Renfrew, ſix miles weſt of Glaſgow.

PASQUIN, a mutilated ſtatue at Rome, in a corner of the palace of the Urſini: it takes its name from a cobler of that city called Paſquin, famous for his ſneers and gibes, and who diverted himſelf with paſſing his jokes on all the people who went through that ſtreet. After his death, as they were digging up the pavement before his ſhop, they found in the earth the ſtatue of an ancient gladiator, well cut, but maimed, and half ſpoiled: this they ſet up in the place where it was found, and by common conſent named it Paſquin. Since that time, all ſatires are attributed to that figure; and are either put into its mouth, or paſted upon it, as if they were wrote by Paſquin redivivus; and theſe are addreſſed by Paſquin to Marforio, another ſtatue at Rome. When Marforio is attacked, Paſquin comes to his aſſiſtance; and when Paſquin is attacked, Marforio aſſiſts him in his turn.

PASQUINADE, a ſatirical libel faſtened to the ſtatue of Paſquin: theſe are commonly ſhort, merry, and pointed; and from hence the term has been applied to all other lampoons of the ſame caſt.

PASSADE, in the menage, is a turn or courſe of a horſe backwards or forwards, on the ſame ſpot of ground.

Birds of PASSAGE, a name given to thoſe birds which at certain ſtated ſeaſons of the year remove from certain countries, and at other ſtated times return to them again, as our quails, woodcocks, ſtorks, nightingales, ſwallows, and many other ſpecies. Among the birds of paſſage, the fieldfare, the redwing, the woodcock, and the ſnipe, come to us in the autumn, at the time when the ſummer-birds are leaving us, and go from us again in ſpring, at the time when theſe return; and of theſe the two laſt often continue with us through the ſummer, and breed; ſo that the two firſt ſeem the only kinds that certainly leave us at the approach of ſpring, retiring to the northern parts of the continent, where they live during the ſummer, and breed; and at the return of winter, are driven ſoutherly from thoſe frigid climes, in ſearch of food, which there the ice and ſnow muſt deprive them of.

PASSANT, in heraldry, a term applied to a lion, or other animal, in a ſhield, appearing to walk leiſurely: for moſt beaſts, except lions, the term trippant is frequently uſed inſtead of paſſant.

PASSAO, or CAPE PASSAO, a promontory of Peru, juſt under the equator: W. long. 81°.

PASSAU, the capital of the biſhopric of the ſame name, in the circle of Bavaria, ſituated on the confluence of the rivers Danube, Inn, and Ilts: E. long. 13° 30′, N. lat. 48° 30′.

PASSERES is the name of a claſs of birds. See NATURAL HISTORY.

PASSERINA, in botany, a genus of the octandria monogynia claſs. It has no calix; the corolla conſiſts of four ſegments, and the ſtamina lie upon the tube. There are eight ſpecies, none of them natives of Britain.

PASSIFLORA, in botany, a genus of the gynandria pentagynia claſs. It has three ſtyli; the calix conſiſts of five leaves, and the corolla of five petals; and the nectarium is a corona; and the berry is ſupported on a pedicle. There are 26 ſpecies, none of them natives of Britain, but are cultivated in gardens for the beauty of their flowers.

PASSIONS, in moral philoſophy, are certain motions of the ſoul, which make it purſue what appears to be good, and avoid whatever threatens evil.

By reflecting, ſays Mr Locke, on the various modifications or tempers of the mind, and the internal ſenſations which pleaſure and pain, good and evil, produce in us, we may thence form to ourſelves the ideas of our paſſions. Thus, by reflecting upon the thought we have of the delight which any thing is apt to produce in us, we form an idea which we call love. Deſire is that uneaſineſs which a man finds in himſelf upon the abſence of any thing, the preſent enjoyment of which cauſes delight. Joy is a delight of the mind, ariſing from the preſent, or aſſured approaching, poſſeſſion of ſome good. Sorrow is an uneaſineſs of the mind, upon the thought of a good loſt, or the ſenſe of a preſent evil. Hope is a pleaſure in the mind, upon the thought of a probable future enjoyment of a thing which is apt to delight. Fear is an uneaſineſs of the mind, upon the thought of a future evil likely to befal us. Anger is a diſcompoſure of the mind, upon the receipt of injury, with a preſent purpoſe of revenge. Deſpair is the thought of the unattainableneſs of any good. Envy is an uneaſineſs of mind, cauſed by the conſideration of a good we deſire, obtained by one we think ſhould not have had it before us.

On the juſt regulation and ſubordination of the paſſions, depends, in a great meaſure, the happineſs of mankind. See MORAL PHILOSOPHY.

PASSIONS, in medicine, make one of the non-naturals, and produce very ſenſible effects. Joy, anger, and fear, are

are the principal. In the two firſt, the ſpirits are hurried with too great vivacity; whereas, in fear or dread, they are is it were curbed and concentrated : whence we may conclude, that they have a very bad effect upon health ; and therefore it will be beſt to keep them within bounds as much as poſſible, and to preſerve an inward ſerenity, calmneſs, and tranquillity.

PASSIONS, in painting, are the external expreſſions of the different diſpoſitions and affections of the mind: but particularly their different effects upon the ſeveral features of the face : for though the arms, and indeed every part of the body, ſerve likewiſe, by their quick, languid, and variouſly diverſified motions, to expreſs the paſſions of the ſoul ; yet, in painting, this difference is moſt conſpicuous in the face.

In ſorrow, joy, love, ſhame, and compaſſion, the eyes ſwell all of a ſudden, are covered with a ſuperabundant moiſture, and drop tears ; and in grief eſpecially, the corners of the mouth hang down, the eye-lids are half ſhut, and the pupil of the eye is elevated and half covered ; and all the other muſcles of the face are relaxed, ſo that the viſage appears longer than ordinary.

In fear, terror, fright, and horror, the eye-brows are greatly elevated ; the eye lids are expanded as wide as poſſible, ſo as to diſcover the white of the eye ; and the pupil is depreſſed, and half covered by the lower eye-lid ; the hair ſtands an end ; the mouth is at the ſame time wide open ; and the lips ſo far drawn back, that the teeth both of the upper and under jaw appear.

Contempt is expreſſed by raiſing one ſide of the upper lip, ſo as to diſcover the teeth, whilſt the other ſide has a movement like that in laughter ; the eye, on that ſide where the teeth appear, is half ſhut, whilſt the other remains open ; however, both the pupils are depreſſed.

In jealouſy, envy, hatred, and malice, the eye-brows are knit ; and, in laughter, all the parts agree, tending as it were towards the centre of the face.

PASSION, *or croſs of the* PASSION, in heraldry, is ſo called, becauſe reſembling the ſhape of that on which our Saviour is thought to have ſuffered ; that is, not croſſed in the middle, but a little below the top, with arms ſhort in proportion to the length of the ſhaft. See plate CXXXIV. fig. 12.

PASSION-FLOWER, in botany. See PASSIFLORA.

PASSION-WEEK, the week immediately preceding the feſtival of Eaſter : ſo called, becauſe in that week our Saviour's paſſion and death happened.

The Thurſday of this week is called Maunday Thurſday ; the Friday, Good Friday ; and the Saturday, the great Sabbath.

PASSIVE, in general, denotes ſomething that ſuffers the action of another called an agent or active power.

In grammar, the verb or word that expreſſes this paſſion, is termed a paſſive verb : which, in the learned languages, has a peculiar termination, as *amor, doceor*, &c. in Latin.

PASSIVE TITLE, in Scots law. See LAW, Tit. xxvii. 30.

PASSOVER, a ſolemn feſtival of the Jews, celebrated on the fourteenth day of the month next after the vernal equinox, and inſtituted in commemoration of their coming out of Egypt ; becauſe on the night before their departure the deſtroying angel, who put to death the firſt born of the Egyptians, paſſed over the houſes of the Hebrews, which were ſprinkled with the blood of a lamb. The whole tranſaction is related in the twelfth chapter of Exodus.

PASS PAROLE, a command given at the head of an army, and thence communicated to the rear by paſſing it from mouth to mouth.

PASS-PORT, or PASS, a licence or writing obtained from a prince or governor, granting liberty and ſafe conduct to paſs through his territories without moleſtation.

PASTEBOARD, a kind of thick paper formed of ſeveral ſheets of paper paſted together.

The chief uſe of paſteboard is in binding books, making letter-caſes, *&c.*

PASTERN *of a horſe*, in the manege, is the diſtance between the joint next the foot, and the coronet of the hoof. This part ſhould be ſhort, eſpecially in middle-ſized horſes, becauſe long paſterns are weak, and cannot ſo well endure travelling.

PASTERN-JOINT, the joint next a horſe's foot.

PASTIL, or PASTEL, among painters, a kind of paſte made of different colours, ground up with gum-water, in order to make crayons

PASTIL, in pharmacy, is a dry compoſition of ſweet-ſmelling reſins, aromatic woods, *&c.* ſometimes burnt to clear and ſcent the air of a chamber.

PASTINACA, in botany, a genus of the pentandria digynia claſs. The fruit is elliptical, and compreſſed. There are two ſpecies, none of them natives of Britain ; but the ſativa, or parſnep, is cultivated in gardens for the ſake of its root, which we uſe as food.

PASTORAL, in general, ſomething that relates to ſhepherds ; hence we ſay, paſtoral life, manners, poetry, *&c.*

The original of poetry is aſcribed to that age which ſucceeded the creation of the world : and as the keeping of flocks ſeems to have been the firſt employment of mankind, the moſt ancient ſort of poetry was, probably, paſtoral. It is natural to imagine, that the leiſure of thoſe ancient ſhepherds admitting and inviting ſome diverſion, none was ſo proper to that ſolitary and ſedentary life as ſinging ; and that in their ſongs they took occaſion to celebrate their own felicity. From hence a poem was invented, and afterwards improved to a perfect image of that happy time ; which, by giving us an eſteem for the virtues of a former age, might recommend them to the preſent. And ſince the life of ſhepherds was attended with more tranquillity than any other rural employment, the poets choſe to introduce their perſons, from whom it received the name of Paſtoral.

A paſtoral is an imitation of the action of a ſhepherd, or one conſidered under that character. The form of this imitation is dramatic, or narrative, or mixed with both ; the fable ſimple ; the manners not too polite, nor too ruſtic ; the thoughts are plain, yet admit a little quickneſs and paſſion, but that ſhort and flowing ; the expreſſion humble, yet as pure as the language will afford ; neat, but not florid ; eaſy, and yet lively. In ſhort, the fable, manners, thoughts, and expreſſions, are full of the greateſt ſimplicity in nature.

The complete character of this poem conſiſts in ſimpliſity, brevity, and delicacy ; the two firſt of which render an eclogue natural, and the laſt delightful.

PASTRY, that branch of cookery, which is chiefly taken up in making pies, paſties, cakes, *&c.*

PASTURE, or PASTURE-LAND, that reſerved for feeding cattle.

Paſture-

Pasture land is of such advantage to husbandry, that many prefer it even to corn-land, because of the small hazard and labour that attends it, and as it lays the foundation for most of the profit that is expected from the arable land, because of the manure the cattle afford which are fed upon it. Where dung is not to be bought, as is often the case in places distant from large towns, the farmer is forced to proportion his arable to his pasture-land, in such manner, that the cattle fed on the latter may be sufficient for a supply of dung, so necessary for producing the fruits of the former.

PATAGONIA, the most southern part of south America, extending from the mouth of Rio di la Plata, in 36° of S. lat. to Cape-Horn, in 55° 30′.

PATAGONULA, or PATAGONICA, in botany, a genus of the pentandria monogynia class. The corolla is rotated; and the stylus is dichotomous. There is but one species, a native of America.

PATAN, the capital of a province in the East Indies, situated two hundred miles north of Huegly in Bengal: E. long. 89°, N. lat. 27° 30′.

PATAVINITY, among critics, denotes a peculiarity of Livy's diction, derived from Patavium, or Padua, the place of his nativity; but wherein this patavinity consists, they are by no means agreed.

PATCHUGA, or PATIOQUE, a city of Mexico, W. long. 103°, N. lat. 21°; subject to Spain.

PATE, in fortification, a kind of platform, resembling what is called an horse-shoe.

PATE′E, or PATTE′E, in heraldry, a cross, small in the centre, and widening to the extremes, which are very broad. See Plate CXXXIV. fig. 13. which is a cross patee, argent, upon a field sable.

PATELLA, in anatomy. See ANATOMY, p. 185.

PATELLA, the LIMPET, is a genus of insects belonging to the order of vermes testacea. It is an animal of the snail kind; the shell consists of one conical valve, without any spiral. There are 36 species, principally distinguished by peculiarities in their shells.

PATENT, in general, denotes something that stands open or expanded: thus a leaf is said to be patent when it stands almost at right angles with the stalk.

PATENT, or LETTERS-PATENT. See LETTER.

PATER PATRATUS, in Roman antiquity, the principal person among the feciales or college of heralds.

PATER NOSTER, the Lord's-prayer, so called from the two first words thereof in Latin.

PATH, in general, denotes the course or tract marked out or run over by a body in motion. For the path of the moon, *&c.* see ASTRONOMY, p. 465.

PATHETIC, whatever relates to the passions, or that is proper to excite or awake them.

PATHOGNOMONIC, among physicians, an appellation for a symptom, or concourse of symptoms, that are inseparable from a distemper, and are found in that only, and in no other.

PATHOLOGY, that part of medicine, which explains the nature of diseases, their causes and symptoms.

PATHOS, a Greek term, literally signifying passion, is sometimes used for the energy of a discourse, or its power to move the passions.

PATMOS, one of the least of the islands of the Archipelago, subject to the Turks: E. long. 27°, and N. lat. 37°.

PATNA, a city of the hither India, the capital of the territory of the same name, in the province of Bengal: E. long. 85°, and N. lat. 26°.

PATANCE, in heraldry, is a cross, flory at the ends; from which it differs only in this, that the ends, instead of turning down like a fleur-de-lis, are extended somewhat in the pattee-form. See FLORY.

PATOWMAC, a great river of Virginia, which arises in the Apalachian mountains, and after separating Virginia from Maryland falls into the bay of Chesepeak.

PATRAS, a city and port-town of European Turky, in the province of the Morea: E. long. 21° 30′, and N. lat. 38° 20′.

PATRES CONSCRIPTI. See CONSRIPT and SENATOR.

PATRIARCHS, among Christians, are ecclesiastical dignitaries, or bishops, so called from their paternal authority in the church. The power of patriarchs was not the same in all, but differed according to the different customs of countries, or the pleasures of kings and councils: thus the patriarch of Constantinople grew to be a patriarch over the patriarchs of Ephesus and Cæsarea, and was called the œcumenical and universal patriarch; and the patriarch of Alexandria had some prerogatives, which no other patriarch besides himself enjoyed, such as the right of consecrating and approving every single bishop under his jurisdiction.

PATRIARCHAL CROSS, in heraldry, is that where the shaft is twice crossed; the lower arms being longer than the upper ones. Plate CXXXIV. fig. 14. is a patriarchal cross, gules, on a field argent.

PATRICIAN, among the ancient Romans, a title given to the descendants of the hundred, or, according to others, of the two hundred first senators chosen by Romulus, and by him called Patres, *Fathers*.

PATRIMONY, a right or estate inherited by a person from his ancestors.

PATRINGTON, a market-town of Yorkshire, situated at the mouth of the Humber, fifty miles east of York.

PATRIPASSIANS, in church-history, a Christian sect, which appeared about the latter end of the IId century; so called from their ascribing the passion to the Father: for they asserted the unity of God in such a manner as to destroy all distinction of persons, and to make the Father and Son precisely the same; in which they were followed by the Sabellians, and others. The author and head of the patripassians was Praxeas, a philosopher of Phrygia in Asia.

PATROL, in war, a round or march made by the guards, or watch, in the night-time, to observe what passes in the streets, and to secure the peace and tranquillity of a city or camp.

PATRON, among the Romans, was an appellation given to a master who had freed his slave. As soon as the relation of master expired, that of patron began; for the Romans, in giving the slaves their freedom, did not despoil themselves of all right and privileges in them; the law still subjected them to considerable services and duties towards their patrons, the neglect of which was very severely punished.

PATRON, in the church of Rome, a saint, whose name a person bears, or under whose protection he is put, and whom he takes particular care to invoke; or a saint, in whose name a church or order is founded.

PATRON,

PATRON, in Scots law. See LAW, Tit. v. 5.

PATRONAGE, the right of disposing a church or benefice, and enjoying several other privileges, such as having the honourable rights of the church, being interred in the chancel, *&c.*

Arms of PATRONAGE, in heraldry, are those on the top of which are some marks of subjection and dependance: thus the city of Paris bears the fleurs de lis in chief, to shew her subjection to the king; and the cardinals on the top of their arms, bear those of the pope, who gave them the hat, to shew that they are his creatures.

PATRONYMIC, among grammarians, is applied to such names of men and women as are derived from those of parents or ancestors.

PAVETTA, in botany, a genus of the tetrandria monogynia class. The corolla consists of one funnel-shaped petal; the stylus is crooked; and the berry contains one seed. There is but one species, a native of India.

PAVIA, a city of Italy, in the duchy of Milan, capital of the Pavesan, the see of a bishop, and university; situated in E. long. 9° 40′, and N. lat. 45° 15′.

PAVIA, in botany. See ÆSCULUS.

PAULIONISTS, in church-history, Christian heretics of the IIId century, disciples of Paul Samosatensis bishop of Antioch, who denied Christ's divinity, maintaining that when we call him the Son of God, we do not thereby mean that he is really and truly God; but only that he was so perfect a man, and so superior in virtue to all others, that he had this name given him by way of eminence.

PAULICIANS, Christian heretics of the VIIth century, disciples of one Constantine, a native of Armenia, and a favourer of the errors of Manes; who, as the name Manichees was become odious to all nations, gave those of his sect the title of Paulicians, on pretence that they followed only the doctrine of St Paul.

PAULINIA, in botany, a genus of the octandria trigynia class. The calix consists of four leaves, the corolla of four petals, and the nectarium of four unequal leaves; it has three compressed, membranaceous capsules. There are seven species, none of them natives of Britain.

PAVO, in ornithology, a genus belonging to the order of gallinæ. The head is covered with feathers which bend backwards; and the feathers of the tail are very long, and beautifully variegated with eyes of different colours. There are three species, *viz.* 1. The cristatus, or common peacock of English authors, has a compressed crest, and solitary spurs, and is a native of Ceylon. 2. The bicalcaratus has a small crest, and double spurs: It is a native of China. 3. The muticus, has a sharp pointed crest, and no spurs, and the orbits of the eyes are red. It is found in Japan.

PAVO, in astronomy. See ASTRONOMY, p. 487.

PAURAEDRASTYLÆ, in natural history, the name of a genus of perfect crystals, with double pyramids, and no intermediate column, composed of twelve planes, or two hexangular pyramids, joined base to base.

PAUSANIA, in Grecian antiquity, a festival, in which were solemn games, wherein nobody contended but free-born Spartans; in honour of Pausanias, the Spartan general, under whose conduct the Greeks overcame Mardonius, in the famous battle at Plateæ.

PAUSE, a stop or cessation of speaking, singing, playing, or the like. The use of pointing in grammar, is to make proper pauses, in certain places. There is a pause in the middle of each verse; in an hemistich it is called a rest or repose.

PAW, in the menage. A horse is said to paw the ground, when his leg, being either tired or painful, he does not rest it upon the ground, and fears to hurt himself as he walks.

PEA, in botany. See PISUM.

PEACH, in botany. See AMYDALUS.

PEACOCK, in ornithology. See PAVO.

PEAK, a rocky mountainous country in the west of Derbyshire, remarkable for its mines of lead and iron, *&c.*

PEAN, in heraldry, is when the field of a coat of arms is sable, and the powderings or.

PEAR, in botany. See PYRUS.

PEARCH, in ichthyology. See PERCA.

PEARCH-GLUE, the name of a kind of glue of remarkable strength and purity, made from the skins of pearches.

PEARL, in natural history, a hard, white, shining body, usually roundish, found in a testaceous fish resembling an oyster.

Pearls, though esteemed of the number of gems by our jewellers, and highly valued, not only at this time, but in all ages, proceed only from a distemper in the creature that produces them, analogous to the bezoars, and other stony concretions in several animals of other kinds.

The fish in which these are usually produced is the East-Indian pearl-oyster, as it is commonly called. Besides this shell, there are many others that are found to produce pearls; as the common oyster, the muscle, and several others; the pearls of which are often very good; but those of the true Indian berberi, or pearl-oyster, are in general superior to all. The small or seed-pearls, also called ounce-pearls, from their being sold by the ounce, and not by tale, are vastly the most numerous and common; but as in diamonds, among the multitudes of small ones, there are smaller numbers of larger found, so in pearls there are larger and larger kinds; but as they increase in size, they are proportionably less frequent, and this is one reason of their great price. We have Scotch pearls frequently as big as a little tare, some as big as a large pea, and some few of the size of a horse-bean; but these are usually of a bad shape, and of little value in proportion to their weight. Philip II. of Spain had a pearl perfect in its shape and colour, and of the size of a pigeon's egg. The finest, and what is called the true shape of the pearl, is a perfect round; but if pearls of a considerable size are of the shape of a pear, as is not unfrequently the case, they are not less valued, as they serve for ear-rings and other ornaments. Their colour ought to be a pure white, and that not a dead and lifeless, but a clear and brilliant one; they must be perfectly free from any foulness, spot or stain; and their surfaces must be naturally smooth and glossy, for they bring their natural polish with them, which art is not able to improve.

All pearls are formed of the matter of the shell, and consist of a number of coats spread with perfect regularity one over another, in the manner of the several coats of an onion, or like the several strata of the stones found in the bladders or stomachs of animals, only much thinner.

Manner of fishing for PEARLS *in the East-Indies.* There are two seasons for pearl-fishing: the first is in March and April,

April, and the laſt in Auguſt and September; and the more rain there falls in the year, the more plentiful are theſe fiſheries. At the beginning of the ſeaſon there are ſometimes two hundred and fifty barks on the banks; the larger barks having two divers, and the ſmaller one. As ſoon as the barks arrive at the place where the fiſh lie, and have caſt anchor, each diver binds a ſtone ſix inches thick, and a foot long, under his body; which ſerves him as ballaſt, prevents his being driven away by the motion of the water, and enables him to walk more ſteadily under the waves. They alſo tie another very heavy ſtone to one foot, by which they are very ſpeedily ſent to the bottom of the ſea: and as the oyſters are uſually firmly faſtened to the rocks, they arm their hands with leather mittens to prevent their being wounded in pulling them violently off; but this taſk ſome perform with an iron-rake. In the laſt place, each diver carries down with him a large net in the manner of a ſack, tied to his neck by a long cord, the other end of which is faſtened to the ſide of the bark. This net is to hold the oyſters gathered from the rock, and the cord is to pull up the diver when his bag is full or he wants air.

In this equipage he ſometimes precipitates himſelf ſixty feet under water; and as he has no time to loſe, he no ſooner arrives at the bottom, than he begins to run from ſide to ſide tearing up all the oyſters he meets with, and cramming them into his budget.

At whatever depth the divers are, the light is ſo great, that they eaſily ſee whatever paſſes in the ſea: and to their great conſternation ſometimes perceive monſtrous fiſhes, from which all their addreſs in mudding the water, *&c.* will not always ſave them, but they unhappily become their prey: and of all the dangers of the fiſhery, this is one of the greateſt and moſt uſual. The beſt divers will keep under water near half an hour, and the reſt do not ſtay leſs than a quarter. During this time they hold their breath without the uſe of oils, or any other liquors; only acquiring the habit by long practice. When they find themſelves ſtraightened, they pull the rope to which the bag is faſtened, and hold faſt by it with both hands; when thoſe in the bark, taking the ſignal, heave them up into the air, and unload them of their fiſh, which is ſometimes five hundred oyſters, and ſometimes not above fifty. Some of the divers need a moment's reſpite to recover breath; others jump in again inſtantly, continuing this violent exerciſe without intermiſſion for ſeveral hours.

On the ſhore they unload their barks, and lay their oyſters in an infinite number of little pits dug in the ſand four or five feet ſquare; raiſing heaps of ſand over them to the height of a man; and in this condition they are left, till the rain, wind, and ſun have obliged them to open, which ſoon kills them: upon this the fleſh rots and dries, and the pearls, thus diſengaged, fall into the pit, on their taking out the ſhells. After clearing the pits of the groſſer filth, they ſift the ſand ſeveral times in order to find the pearl: but whatever care they take, they always loſe a great many. After cleaning and drying the pearls, they are paſſed through a kind of ſieve, according to their ſizes; the ſmalleſt are then ſold as ſeed-pearls, and the reſt put up to auction, and ſold to the higheſt bidder.

Artificial PEARLS, are made by reducing ſeed-pearls to a paſte, by means of a chemical preparation called mercurial water, making the beads in ſilver-moulds, boring them with a hog's briſtle, and drying them in a cloſed glaſs in the ſun.

Beads, in imitation of pearls, are alſo made of wax, and covered with the ſcales of ſeveral kinds of fiſhes.

Mother of PEARL, is the ſhell, not of the pearl-oyſter, but of another ſea-fiſh of the oyſter-kind. This ſhell on the inſide is extremely ſmooth, and of the whiteneſs and water of pearl itſelf; and it has the ſame luſtre on the outſide, after the firſt laminæ or ſcales have been cleared off with aquafortis and the lapidaries mill. Mother of pearl is uſed in inlaid works, and in ſeveral toys, as ſnuff-boxes, *&c.*

PEARL-ISLANDS, ſeveral ſmall iſlands ſituated in the bay of Panama: W. long. 81°, and between 7° and 9° of north lat.

PEAT, a kind of turf uſed for fuel in ſeveral countries.

PEBBLES, the name of a genus of foſſils, diſtinguiſhed from the flints and homochroa by their having a variety of colours. Theſe are defined to be ſtones, compoſed of a cryſtalline matter, debaſed by earths of various kinds in the ſame ſpecies, and then ſubject to veins, clouds, and other variegations; uſually formed by incruſtations round a central nucleus, but ſometimes the effect of a ſimple concretion, and veined like the agates, by the diſpoſition the motion of the fluid they were formed in gave their differently coloured ſubſtances.

PECCANT, in medicine, a term uſed for thoſe humours of the body which offend either by their quantity or quality.

PECK, a meaſure of capacity, four of which make a buſhel.

PECORA, in natural hiſtory, the name of a claſs of quadrupeds. See NATURAL HISTORY.

PECTORAL, an epithet for medicines good for diſorders of the breaſt and lungs.

PECTORALIS, in anatomy. See ANATOMY, p. 194, 195.

PECTORIS os, in anatomy. See ANATOMY, p. 175.

PECULIUM, the ſtock or eſtate which a perſon in the power of another, as a ſlave, may acquire by his induſtry.

PEDAGOGUE, a tutor or maſter, to whom is committed the diſcipline and direction of a ſcholar.

PEDANT, is uſed for a rough unpoliſhed man of letters, who makes an impertinent uſe of the ſciences, and abounds in unſeaſonable criticiſms and obſervations.

PEDARIAN, in Roman antiquity, thoſe ſenators who ſignified their votes by their feet, not their tongues; that is, ſuch as walked over to the ſide of thoſe whoſe opinion they approved of, in diviſions of the houſe.

PEDESTAL, in architecture. See ARCHITECTURE, p. 356.

PEDICLE, among botaniſts, that part of a ſtalk which immediately ſuſtains the leaf of a flower or a fruit, and is commonly called a foot-ſtalk.

PEDICULARIS, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five ſegments; the capſule is ſharp-pointed, oblique, and has two cells; and the ſeeds are covered with a tunic. There are 14 ſpecies, two of which are natives of Britain, *viz.* the ſylvatica, or common louſe-wort; and the paluſtris, or marſh louſe-wort.

This plant is of a cooling and drying nature, whence it

it is recommended in fiſtulas and other ſinous ulcers.

PEDICULUS, LOUSE, in zoology, a genus of inſects belonging to the order of aptera. It has ſix feet, two eyes, and a ſort of ſting in the mouth; the feelers are as long as the thorax; and the belly is depreſſed, and ſublobated. There are 40 ſpecies, denominated from the different creatures they inhabit. The beſt antidote againſt this kind of vermin, is cleanlineſs.

PEDILUVIUM, a bathing of the feet. This bath may be prepared of the ſame ingredients with other baths. It may either conſiſt of light pure water alone; or, to correct the qualities of heavy and hard water, a lixivium or bran of wheat or chamomile-flowers may be added.

PEDIMENT, in architecture. See ARCHITECTURE, p. 356.

PEDIR, a town in the iſland of Sumatra, in the Eaſt-Indies, ſituated in E. long. 94° lat. 5°.

PEDUNCLE, among botaniſts. See PEDICLE.

PEDUNCULI CEREBELLI, in anatomy. See ANATOMY, p. 287.

PEEBLES, a town of Scotland, capital of the ſhire of Tweedale, ſituated on the river Tweed, twenty-two miles ſouth of Edinburgh.

PEEK, in the ſea-language, is a word uſed in various ſenſes. Thus the anchor is ſaid to be a-peek, when the ſhip being about to weigh comes over her anchor in ſuch a manner that the cable hangs perpendicularly betwixt the hauſe and the anchor. To heave a peek is to bring the peek ſo as that the anchor may hang a-peek.

PEER, in general, ſignifies an equal, or one of the ſame rank and ſtation.

The term peer is now applied to thoſe who are impannelled in an inqueſt upon a perſon for convicting or acquitting him of any offence laid to his charge; and the reaſon why the jury is ſo called, is, becauſe by the common law, and the cuſtom of this kingdom, every perſon is to be tried by his peers or equals, a lord by the lords, and a commoner by commoners.

PEER *of the realm*, a noble lord who has a ſeat and vote in the houſe of lords, which is alſo called the houſe of peers. Theſe lords are called peers, becauſe, though there is a diſtinction of degrees in our nobility, yet in public actions they are equal, as in their votes in parliament, and in trying any nobleman or other perſon impeached by the commons, *&c.* See PARLIAMENT.

PEERS *of France*, the twelve great lords of that kingdom, of which ſix are dukes, and ſix counts; and of theſe, ſix are eccleſiaſtics, and ſix laymen: thus, the archbiſhop of Rheims, and the biſhop of Laon and Langres are dukes and peers; and the biſhops of Chalon on the Marn, Noyons, and Beauvais, are counts and peers. The dukes of Burgundy, Normandy, and Aquitain, are lay peers and dukes; and the counts of Flanders, Champaign, and Toloufe, lay peers and counts. Theſe peers ſtill aſſiſt at the coronation of kings, either in perſon or by their repreſentatives, where each performs the functions attached to his reſpective dignity: but as the ſix lay peerages are all at preſent united to the crown except that of the count of Flanders, ſix lords of the firſt quality are choſen to repreſent them; but the eccleſiaſtical peers uſually aſſiſt in perſon. At preſent the title of peer is beſtowed on every lord whoſe eſtate is erected into a peerage, the number of which is uncertain, and it depends entirely on the king.

PEERESS, a woman who is noble by deſcent, creation, or marriage.

If a peereſs, by deſcent or creation, marries a perſon under the degree of nobility, ſhe ſtill continues noble; but if ſhe obtains that dignity only by marriage, ſhe loſes it on her afterwards marrying a commoner; yet, by the curteſy of England, ſhe always retains the title of her nobility.

PEEVIT, in ornithology. See LARUS.

PEGANUM, in botany, a genus of the dodecandria monogynia claſs. The corolla conſiſts of five petals, and the calix of five leaves; the capſule has three cells, and three valves, containing many ſeeds. There are two ſpecies, none of them natives of Britain.

PEGASUS, in aſtronomy. See ASTRONOMY, p. 487.

PEGU, the capital of the kingdom of Pegu, and ſituated upon a river of the ſame name, in 97° E. long. and N. lat. 17° 30′.

PEKIN, the metropolis of the empire of China, is ſituated in E. long. 111°, and N. lat. 40°.

It is about twenty miles in circumference, and is ſaid to contain 2,000,000 of people.

PELAGIANS, a Chriſtian ſect who appeared about the latter end of the fourth, or the beginning of the fifth century.

Pelagius, the author of this ſect, was born in Wales, and his name was Morgan, which in the Welſh language ſignifies ſea-born; from whence he had his Latin name Pelagius. Some of our ancient hiſtorians pretend that he was abbot of Bangor: but this is impoſſible, becauſe the Britiſh monaſteries were of a later date. St Auſtin gives him the character of a very pious man, and a Chriſtian of no vulgar rank: according to the ſame father, he travelled to Rome, where he aſſociated himſelf with perſons of the greateſt learning and figure, and wrote his commentaries on St Paul's Epiſtles, and his letters to Melania and Demetrias; but being charged with hereſy, he left Rome, and went into Africa, and from thence to Jeruſalem, where he ſettled. He died ſomewhere in the eaſt; but where, is uncertain. He was charged with maintaining the following doctrines: 1. That Adam was by nature mortal, and, whether he had ſinned or not, would certainly have died. 2. That the conſequences of Adam's ſin were confined to his own perſon. 3. That new-born infants are in the ſame condition with Adam before the fall. 4. That the law qualified men for the kingdom of heaven, and was founded upon equal promiſes with the goſpel. 5. That the general reſurrection of the dead does not follow in virtue of our Saviour's reſurrection. 6. That the grace of God is given according to our merits. 7. That this grace is not granted for the performance of every moral act; the liberty of the will, and information in points of duty being ſufficient, *&c.*

PELICANUS, in ornithology, a genus belonging to the order of anſeres. The bill is ſtrait, without teeth, and crooked at the point; the face is naked; and the feet are palmated. There are eight ſpecies, principally diſtinguiſhed by the ſhape of their tails.

PELICAN, in ornithology. See PELICANUS.

PELICAN, in chemiſtry. See CHEMISTRY, p. 109.

PELLETS,

PELLETS, in heraldry, thoſe roundles that are black, called alſo ogreſſes and gunſtones, and by the French torteaux de ſable.

PELLICLE, among phyſicians, *&c.* denotes a thin film, or fragment of a membrane.

PELVIS, in anatomy. See ANATOMY, p. 173.

PEMBROKE, the capital of Pembrokeſhire, in ſouth Wales: W. long. 5°, N. lat. 51° 45′. This town ſends two members to parliament.

PENAL *action*, in Scots law. See LAW, Tit. xxx. 17.

PENANCE, a puniſhment, either voluntary, or impoſed by authority, for the faults a perſon has committed. Penance is one of the ſeven ſacraments of the Romiſh church. Beſides faſting, alms, abſtinence, and the like, which are the general conditions of penance; there are others of a more particular kind, as the repeating a certain number of ave-marys, pater-noſters, and credos, wearing a hair-ſhirt, and giving one's ſelf a certain number of ſtripes. In Italy and Spain it is uſual to ſee Chriſtians almoſt naked, loaded with chains and a croſs, and laſhing themſelves at every ſtep.

PENÆA, in botany, a plant of the tetrandria monogynia claſs. The calix conſiſts of two leaves; the corolla is bell ſhaped; the ſtylus is quadrangular; and the capſule is triangular, with four cells containing eight ſeeds. There are three ſpecies, none of them natives of Britain.

PENATES, in Roman antiquity, a kind of tutelar deites, either of countries or particular houſes; in which laſt ſenſe, they differed in nothing from the lares. See LARES.

PENCIL, an inſtrument uſed by painters for laying on their colours. Pencils are of various kinds, and made of various materials; the larger ſorts are made of boars briſtles, the thick ends of which are bound to a ſtick, bigger or leſs according to the uſes they are deſigned for: theſe, when large, are called bruſhes. The finer ſorts of pencils are made of camels, badgers, and ſquirrels-hair, and of the down of ſwans; theſe are tied at the upper end with a piece of ſtrong thread, and incloſed in the barrel of a quill.

PENDANT, an ornament hanging at the ear, frequently conſiſting of diamonds, pearls, and other precious ſtones.

PENDANTS, in heraldry, parts hanging down from the label, to the number of three, four, five, or ſix at moſt, reſembling the drops in the Doric frieze. When they are more than three, they muſt be ſpecified in blazoning.

PENDANTS of a ſhip, are thoſe ſtreamers or long colours which are ſplit and divided into two parts ending in points, and hung at the head of maſts, or at the yard-arm ends.

PENDULOUS, a term applied to any thing that bends or hangs downwards.

PENDULUM, in mechanics, denotes any heavy body, ſo ſuſpended as that it may vibrate or ſwing, backwards and forwards, about ſome fixed point, by the force of gravity. See MECHANICS.

PENETRALE, in Roman antiquity, properly denoted the chapel conſecrated to the penates, or houſhold-gods.

PENGUIN ISLAND and BAY, are ſituated on the coaſt of Patagonia in South America: W. long. 70°, S. lat 47°.

PENGUIN in ornithology. See ALCA.

PENICHE, a port-town of Portugal, in the province of Eſtremadura, ſituated on the Ocean forty miles north of Liſbon: W. long. 9° 6′, N. lat. 39° 20′.

PENICILLUS, among ſurgeons, is uſed for a tent to be put into wounds or ulcers.

PENINSULA, in geography, a portion or extent of land, joining to the continent by a narrow neck or iſthmus, the reſt being encompaſſed with water.

PENIS, in anatomy. See ANATOMY, p. 270.

PENISCOLA, a port town of Spain, in the province of Valencia, ſituated on the Mediterranean, under the meridian of London, and in N. lat. 40° 29′.

PENNY, an ancient ſilver-coin, which, though now little uſed, was the only one current among our Saxon anceſtors.

PENNY-EARTH, in agriculture, denotes a hard, loamy, or ſandy earth, with a large proportion of ſea-ſhells intermixed with it.

PENNY-WEIGHT, a troy-weight, containing twenty-four grains, each of which is equal in weight to a grain of wheat, gathered out of the middle of the ear, and well dried.

PENRISE, a port-town of Wales, in the county of Glamorgan, ſituated on Briſtol channel, ſeventeen miles ſouth of Caermarthen.

PENRYN, a borough-town of Cornwal, near a bay of the Engliſh channel: W. long. 5° 35′, N. lat. 50° 20′. It ſends two members to parliament.

PENSANCE, a market-town of Cornwal, eight miles eaſt of the Land's end.

PENSILVANIA, one of the Engliſh plantations in America, two hundred miles in length, and almoſt as much in breadth: ſituated between 74 and 78° of weſt longitude, and between 39 and 42° of north latitude: a fine fruitful country, bounded by the five nations of the Irequois on the north, by New-Jerſey and New-York on the eaſt, and by Maryland on the ſouth and weſt. It is a proprietary government, the heirs of Mr. Penn, a quaker, who ſettled this country, appointing the governor.

PENSION, a ſum of money paid annually for ſervices or conſiderations already paſt. The yearly payment of each member to the houſes of the inns of courts, are likewiſe termed penſions; and the yearly aſſembly of the members of the ſociety of Gray's Inn, to conſult on the affairs of the houſe, is alſo called a penſion.

PENSIONER, in general, denotes a perſon who receives a penſion, yearly ſalary, or allowance. Hence,

The band of gentleman-penſioners, the nobleſt ſort of guard to the king's perſon, conſiſts of forty gentlemen, who receive a yearly penſion of one hundred pounds. This honourable band was firſt inſtituted by king Henry VIII. and their office is to attend the king's perſon, with their battle-axes, to and from his chapel-royal, and to receive him in the preſence chamber, or coming out of his privy-lodgings; they are alſo told to attend at all great ſolemnities, as coronations, St. George's feaſt, public audiences of ambaſſadors, at the ſovereign's going to parliament, *&c.*

They are each obliged to keep three double horſes and a ſervant, and ſo are properly a troop of horſe. They wait half at a time, quarterly; but on Chriſtmas-day, Eaſter-day, Whitſunday, *&c.* and on extraordinary occaſions, they are all obliged to give their attendance.

PENTACROSTIC, in poetry, a ſet of verſes ſo diſpoſed as that there are always five acroſtics of the ſame name, in five diviſions of each verſe.

PENTAEDROSTYLA, in natural hiſtory, the name of a genus of ſpars. See SPAR.

The

The bodies of this genus are ſpars, in form of pentangular columns, terminated by pentangular pyramids at one end, and irregularly affixed at the other to ſome ſolid body.

PENTAGON, in geometry, a figure of five ſides and five angles. See GEOMETRY.

PENTAGRAPH, an inſtrument whereby deſigns of any kind may be copied in what proportion you pleaſe, without being ſkilled in drawing.

PENTAMETER, in ancient poetry, a kind of verſe conſiſting of five feet, or metres; whence the name.

The two firſt feet may be either dactyls or ſpondees, at pleaſure; the third is always a ſpondee, and the two laſt anapeſts.

PENTANDRIA, in botany. See BOTANY, p. 635.

PENTAPETALOUS, an appellation given to flowers that conſiſt of five petals or leaves.

PENTAPETES, in botany, a genus of the monodelphia decandria claſs. The calix is ſimple; the capſule has five cells, containing many membranaceous ſeeds. There are three ſpecies, none of them natives of Britain.

PENTASTYLE, in architecture, a building wherein there are five rows of columns.

PENTATEUGH, an appellation given to the firſt five books of the Old Teſtament, *viz.* Geneſis, Exodus, Leviticus, Numbers, and Deuteronomy, *&c.*

PENTATHLON, in antiquity, a general name for the five exerciſes performed at the Grecian games, *viz.* wreſtling, boxing, leaping, running, and playing at the diſcus.

PENTECOST, a ſolemn feſtival of the Jews, ſo called becauſe it was celebrated on the fiftieth day after the ſixteenth of the month Niſan, which was the ſecond day of the paſſover. See PASSOVER.

The feaſt of pentecoſt was inſtituted in memory of the Law's being given on the fiftieth day after the Iſraelites came out of Egypt.

PENTHORUM, in botany, a genus of the decandria pentagynia claſs. The calix conſiſts of five ſegments; the petals are from five to nine; and the capſule has five cells. There is but one ſpecies, *viz.* the ſedoides, a native of Virginia.

PENULTIMA, or PENULTIMATE SYLLABLE, in grammar, denotes the laſt ſyllable but one of a word, and hence the anti-penultimate ſyllable is the laſt but two, or that immediately before the penultima.

PENUMBRA, in aſtronomy, a partial ſhade obſerved between the perfect ſhadow and the full light in an eclipſe.

It ariſes from the magnitude of the ſun's body; for were he only a luminous point, the ſhadow would be all perfect; but by reaſon of the diameter of the ſun, it happens that a place which is not illuminated by the whole body of the ſun does yet receive rays from a part thereof.

PEPLIS, in botany, a genus of the hexandria monogynia claſs. The perianthium is bell-ſhaped, with twelve ſegments; the petals are ſix, inſerted into the calix; and the capſule has two cells. There are two ſpecies, none of them natives of Britain.

PEPO, in botany. See CUCURBITA.

PEPPER, in botany, See PIPER.

PEPPER-MINT. See MENTHA.

PERA, one of the ſuburbs of Conſtantinople, where ambaſſadors and Chriſtians uſually reſide.

PERAMBULATOR, in ſurveying, an inſtrument for meaſuring diſtances, called alſo pedometer, way-wiſer, and ſurveying wheel.

It conſiſts of a wheel AA (Plate CXXXIV. fig. 15. n° 1.) two feet ſeven inches and a half in diameter; conſequently half a pole, or eight feet three inches, in circumference. On one end of the axis is a nut, three quarters of an inch in diameter, and divided into eight teeth; which, upon moving the wheel round, fall into the eight teeth of another nut *c* (*ibid.* n° 2.) fixed on one end of an iron-rod Q, and thus turn the rod once round in the time the wheel makes one revolution. This rod, lying along a groove in the ſide of the carriage of the inſtrument, under the dotted line, has at its other end a ſquare hole, into which is fitted the end *b* of a ſmall cylinder P. This cylinder is diſpoſed (*ibid* n° 3.) under the dial-plate of a movement, at the end of the carriage B, in ſuch a manner as to be moveable about its axis: its end *a* is cut into a perpetual ſcrew, which falling into the thirty-two teeth of a wheel perpendicular thereto, upon driving the inſtrument forward, that wheel makes a revolution each ſixteenth pole. On the axis of this wheel is a pinion with ſix teeth, which, falling into the teeth of another wheel of ſixty teeth, carries it round every hundred and ſixtieth pole, or half a mile.

This laſt wheel, carrying a hand or index round with it over the diviſions of a dial-plate, whoſe outer limb is divided into one hundred and ſixty parts, correſponding to the one hundred and ſixty poles, points out the number of poles paſſed over. Again, on the axis of this laſt wheel is a pinion, containing twenty teeth, which falling into the teeth of a third wheel which hath forty teeth, drives it once round in three hundred and twenty poles, or a mile. On the axis of this wheel is a pinion of twelve teeth, which, falling into the teeth of a fourth wheel having ſeventy-two teeth, drives it once round in twelve miles.

This fourth wheel, carrying another index over the inner limb of the dial-plate, divided into twelve for miles, and each mile ſubdivided into halves, quarters, and furlongs, ſerves to regiſter the revolutions of the other hand, and to keep account of the half miles and miles paſſed over as far as twelve miles.

The uſe of this inſtrument is obvious from its conſtruction. Its proper office is in the ſurveying of roads and large diſtances, where a great deal of expedition, and not much accuracy, is required. It is evident, that driving it along, and obſerving the hands, has the ſame effect as dragging the chain, and taking account of the chains and links.

Its advantages are its handineſs and expedition; its contrivance is ſuch, that it may be fitted to the wheel of a coach, in which ſtate it performs its office, and meaſures the road without any trouble at all.

PERCA, the PEARCH, in ichthyology, a genus belonging to the order of thoracici. The head is furniſhed with ſcaly and ſerrated opercula; there are ſeven rays in the membrane of the gills; and the fins on the back are prickly. There are 38 ſpecies, principally diſtinguiſhed by peculiarities in the back fins.

PERCEPTION, in logic, the firſt and moſt ſimple act of the mind, whereby it perceives or is conſcious of its ideas. See LOGIC.

PERCH. See PERCA.

PERCOLATION. See FILTRATION.

PERCUSSION, in mechanics, the impreſſion a body makes in falling or ſtriking upon another, or the ſhock of two bodies in motion.

PERDIX. See TETRAO.

PERENNIAL, in botany, is applied to thoſe plants whoſe roots will abide many years, whether they retain their leaves in winter or not: thoſe which retain their leaves are called evergreens; but ſuch as caſt their leaves, are called deciduous, or perdifols.

PERFORANS MANUS, in anatomy. See ANATOMY, p. 201.

PERFORANS PEDIS, in anatomy. See ANATOMY, p. 211.

PERFORATUS MANUS, in anatomy. See ANATOMY, p. 201.

PERFORATUS PEDIS, in anatomy. See ANATOMY, p. 211.

PERFUME, an agreeable odour, affecting the organ of ſmelling. The generality of perfumes are made up of muſk, ambergreaſe, civet, roſe and cedar-woods, orange-flowers, jaſmin, jonquils, tuberoſes, and other odoriferous flowers. Thoſe drugs commonly called aromatics, ſuch as ſtorax, frankincenſe, benzoin, cloves, mace, *&c.* enter the compoſition of a perfume: ſome are alſo compoſed of aromatic herbs or leaves, as lavender, marjoram, ſage, thyme, hyſſop, *&c.*

Perfumes were anciently very much in uſe: but ſince people are become ſenſible of the harm they do to the head, they are generally diſuſed among us; however, they are ſtill common in Spain and Italy.

PERGA, a port-town of European Turkey, in the province of Albina, oppoſite to the iſland of Corfu, in E. long. 21°, N. lat. 39° 20′.

PERGAMUS, an ancient city of the leſſer Aſia, in the province of Phrygia, ſituated north of Symrna.

PERIAGOGE, in rhetoric, is uſed where many things are accumulated into one period which might have been divided into ſeveral.

PERIANTHIUM, in botany. See BOTANY, p. 637.

PERICARDIUM, in anatomy. See ANATOMY, p. 279.

PERICARPIUM, among botaniſts. See BOTANY, p. 637.

PERICHORUS, in antiquity, a name given by the Greeks to their profane games and combats, that is, to ſuch as were not conſecrated to any of the gods.

PERICRANIUM, in anatomy. See ANATOMY, p 288.

PERIGEE, in aſtronomy, that point of the ſun's or moon's orbit wherein they are at their leaſt diſtance from the earth, in which ſenſe it ſtands oppoſed to apogee.

PERIGRAPHE, a word uſually underſtood to expreſs a careleſs or inaccurate delineation of any thing; but in Veſalius it is uſed to expreſs the white lines or impreſſions that appear in the muſculus rectus of the abdomen.

PERIGUEUX, a city of France, in the province of Guienne, capital of the territory of Perigord, ſituated on the river Liſle: in E. long. 25′, N. lat. 45° 15′.

PERIHELIUM, in aſtronomy, that point of a planet's or comet's orbit, wherein it is in its leaſt diſtance from the ſun; in which ſenſe it ſtands in oppoſition to aphelium.

PERIMETER, in geometry, the bonds or limits of any figure or body.

PERINÆUM, or PERINEUM, in anatomy, the ſpace between the anus and the parts of generation, divided into two equal lateral diviſions, by a very diſtinct line, which is longer in males than in females.

PERIOD, in aſtronomy, the time taken up by a ſtar or planet in making a revolution round the ſun; or the duration of its courſe till it return to the ſame point of its orbit. See ASTRONOMY,

PERIOD, in grammar, denotes a ſmall compaſs of diſcourſe, containing a perfect ſentence, and diſtinguiſhed at the end by a point, or full ſtop, thus (.); and its members or diviſions marked by commas, colons, *&c.*

PERIODIC, or PERIODICAL, ſomething that terminates and comprehends a period; ſuch is a periodic month, being the ſpace of time wherein the moon diſpatches her period.

PERIOECI, in geograpy, ſuch inhabitants of the earth, as have the ſame latitudes, but oppoſite longitudes; or live under the ſame parallel, and the ſame meridian, but in different ſemicircles of that meridian, or in oppoſite points of the parallel.

PERIOPHTHALMIUM, in natural hiſtory. See NICTITATING MEMBRANE.

PERIOSTEUM, in anatomy. See ANATOMY, p. 145.

PERIPATETIC PHILOSOPHY, that ſyſtem taught and eſtabliſhed by Ariſtotle, and maintained by his followers the peripatetics, called alſo Ariſtotelians.

PERIPETIA, in the drama, that part of a tragedy wherein the action is turned, the plot unravelled, and the whole concludes.

PERIPHERY, in geometry, the circumference of a circle, ellipſes, or any other regular curvilinear figure.

PERIPLOCA, in botany, a genus of the pentandria digynia claſs. The nectarium ſurrounds the inſide of the flower, and includes the filaments and ſtyli. There are four ſpecies, none of them natives of Britain.

PERIPNEUMONY, in medicine. See MEDICINE, p. 91.

PERISCII, in geography, the inhabitants of either frigid zone, between the polar circles and the poles; where the ſun, when in the ſummer-ſigns, moves only round about them, without ſetting, and conſequently their ſhadows, in the ſame day, turn to all the points of the horizon.

PERISTALTIC, a vermicular ſpontaneous motion of the inteſtines, performed by the contraction of the circular and longitudinal fibres, of which the fleſhy coats of the inteſtines is compoſed; by means whereof the chyle is driven into the orifices of the lacteal veins, and the fæces are protruded towards the anus.

PERISTAPHYLINUS, in anatomy. See ANATOMY, p. 303.

PERISTYLE, in ancient architecture, a building encompaſſed with a row of columns on the inſide.

PERISYSTOLE, the interval of reſt between the two motions of the heart, *viz.* that of the ſyſtole or contraction, and that of the diaſtole or dilation.

PERITONÆUM, in anatomy. See ANATOMY, p. 257.

PERITROCHIUM, in mechanics, denotes a wheel, or circle, concentric with the baſe of a cylinder, and moveable together with it about an axis. See MECHANICS.

PERJURY, in law, the crime of ſwearing falſely, where a lawful oath is adminiſtered by one in authority, in a matter relating to the iſſue or cauſe in queſtion, whether it be a perſon's own wilful act, or done by the ſubornation of others.

At the common law, perjury, and the ſubornation of it,

it, are punishable by fine, imprisonment, pillory, transportation, *&c.* See LAW, Tit. xxxiii. 34.

PERMEABLE, a term applied to bodies of so loose and porous a structure, as to let something pass through them.

PERMUTATION, in commerce, the same with bartering. See COMMERCE.

PERNAMBUCO, a province of Brasil, in America, bounded by the province of Tamera on the north, by the Atlantic ocean on the east, by the province of Seregippa on the south, and by the country of the Tapuyers on the west; being two hundred miles long, and one hundred and fifty broad.

PERONÆUS, in anatomy. See ANATOMY, p. 209.

PERORATION, in rhetoric, the epilogue, or last part of an oration, wherein what the orator had insisted on through his whole discourse, is urged afresh with greater vehemence and passion.

PEROUSA, a town of Italy, in the province of Piedmont, capital of one of the valleys of the Vaudois, situated twelve miles south-west of Turin.

PERPENDICULAR, in geometry, a line falling directly on another line, so as to make equal angles on each side. See GEOMETRY.

PERPETUAL MOTION. See MOVEMENT.

PERPIGNAN, a city of Spain, in the province of Catalonia, capital of the territory of Roussillon, situated on the river Latet: in E. long. 2° 35′, N. lat. 43°.

PERRUKE, or PERRIWIG, was anciently used for a head of long natural hair, particularly such as was curled and adjusted with great care. But it is now used for a set of borrowed hair, curled, baked, interwoven between four threads, and sewed together on a cawl.

PERRY, a drink made of pears, in the same manner as cyder is made from apples. See CYDER.

PERSECUTION, is any pain or affliction which a person designedly inflicts upon another; and, in a more restrained sense, the sufferings of Christians on account of their religion.

Historians usually reckon ten general persecutions; the first of which was under the emperor Nero, thirty one years after our Lord's ascension; when that emperor having set fire to the city of Rome, threw the odium of that execrable action on the Christians, who under that pretence were wrapped up in the skins of wild beasts, and worried and devoured by dogs; others were crucified, and others burnt alive. The second was under Domitian, in the year 95. In this persecution St John the apostle was sent to the isle of Patmos, in order to be employed in digging in the mines. The third began in the third year of Trajan, in the year 100, and was carried on with great violence for several years. The fourth was under Antoninus the philosopher, when the Christians were banished from their houses, forbidden to shew their heads, reproached, beaten, hurried from place to place, plundered, imprisoned, and stoned. The fifth began in the year 197, under the emperor Severus. The sixth, began with the reign of the emperor Maximinus, in 235. The seventh, which was the most dreadful persecution that ever had been known in the church, began in the year 250, in the reign of the emperor Decius, when the Christians were in all places driven from their habitations, stripped of their estates, tormented with racks, *&c.* The eighth began in the year 257, in the fourth year of the reign of the emperor Valerian. The ninth was under the emperor Aurelian A. D. 274, but this was very inconsiderable: and the tenth began in the nineteenth year of Dioclesian, A. D. 303. In this dreadful persecution, which lasted ten years, houses filled with Christians were set on fire; and whole droves were tied together with ropes, and thrown into the sea.

PERSEPOLIS, formerly a city of Persia, but now in ruins. Here are the most magnificent remains of a palace, or temple, that are now in being on the face of the earth: E. long. 54°, N. lat. 30° 30′.

PERSEUS, in astronomy. See ASTRONOMY, p. 486.

PERSIA, a large kingdom of Asia, 1200 miles long, and almost as much broad; situated between 45 and 67° of E. long. and between 25° and 45° of N. lat. bounded by Circassian Tartary, the Caspian Sea, and the river Oxus, on the north; by India on the east; by the Indian Ocean, and the gulphs of Ormus and Persia, on the south; and by the Turkish empire on the west.

PERSICA, in botany. See AMYGDALUS.

PERSICARIA, in botany. See POLYGONUM.

PERSON, an individual substance of a rational or intelligent nature. Thus we say, an ambassador represents the person of his prince; and that, in law, the father and son are reputed the same person.

PERSON, in grammar, a term applied to such nouns or pronouns, as, being either prefixed or understood, are the nominatives in all inflections of a verb; or it is the agent or patient in all finite and personal verbs. See GRAMMAR.

PERSONAL RIGHT, in Scots law. See LAW, Tit. xx. 1.

PERSONAL VERB, in grammar, a verb conjugated in all the three persons; thus called, in opposition to an impersonal verb, or that which has the third person only.

PERSONALITY, in the schools, that which constitutes an individual or distinct person.

PERSONIFYING, the giving an inanimate being the figure, sentiments, and language of a person.

Personifying is essential to poetry, especially to the epopœia: the poets have therefore personified all the passions, and even represented them as deities; as the goddess Persuasion, the god Sleep; the Furies, Envy, Discord, and Fame, Fortune, Victory, Sin, Death, *&c.*

PERSPECTIVE.

PERSPECTIVE teaches how to represent objects on a plane superficies, such as they would appear at a certain distance and height, upon a transparent plane perpendicular to the horizon, placed between the objects and the eye.

In order to understand this subject, a general knowledge of the principles of Optics is absolutely necessary. The foundation

dation of perſpective may be underſtood by ſuppoſing the pantagon ABDEF (Plate CXLIII. fig. 1.) were to be repreſented by the rules of perſpective on the tranſparent plane VP placed perpendicularly on the horizontal plane HR; dotted lines are imagined to paſs from the eye C to each point of the pentagon, as CA, CB, CD, *&c.* which are ſuppoſed in their paſſage through the plane PV to leave their traces or veſtigia in the points *a,b,d*, &c. on the plane, and thereby to delineate the pentagon *abdef*; which, as it ſtrikes the eye by the ſame rays that the original pentagon ABDEF does, will be a true perſpective repreſentation of it.

The buſineſs of perſpective, therefore, is to lay down geometrical rules for finding the points *a,b,d,e,f*, upon the plane; and hence alſo we have a mechanical method of delineating any object very accurately.

Perſpective is either employed in repreſenting the ichnographies or ground plots of objects; or the ſcenographies, or repreſentations of the objects themſelves.

But before we give any examples of either, it will be proper to explain ſome techanical terms in regard to perſpective in general: and firſt, the horizontal line is that ſuppoſed to be drawn parallel to the horizon through the eye of the ſpectator; or rather it is a line which ſeparates the heaven from the earth, and which limits the ſight. Thus, A,B, (*ibid* fig. 2.) are two pillars below the horizontal line CD, by reaſon the line is elevated above them; in fig. 3. they are ſaid to be equal with it, and in fig. 4. raiſed above it. Thus, according to the different points in view, the objects will be either higher or lower than the horizontal line. The point of ſight A (*ibid.* fig. 5.) is that which makes the centrical ray on the horizontal line *ab*; or, it is the point where all the other viſual rays DD unite. The points of diſtance, C,C, are points ſet off in the horizontal line at equal diſtances on each ſide of the point of ſight A; and in the ſame figure BB repreſents the baſe line, or fundamental line: EE is the abridgment of the ſquare; of which D,D, are the ſides; F,F, the diagonal lines, which go to the points of diſtance C,C. Accidental points are thoſe where the objects end: theſe may be caſt negligently; becauſe neither drawn to the point or ſight, nor to thoſe of diſtance, but meeting each other in the horizontal line. For example, two pieces of ſquare timber G and H (*ibid.* fig. 6.) make the points I,I,I,I on the horizontal line; but go not to the point of ſight K, nor to the points of diſtance C,C; theſe accidental points ſerve likewiſe for caſements, doors, windows, tables, chairs, *&c.* The point of direct view, or of the front, is when we have the object directly before us; in which caſe, it ſhews only the foreſide; and, if below the horizon, a little of the top; but nothing of the ſides, unleſs the object be polygonous.

Thus the plan ABCD, (*ibid.* fig. 7.) is all in front, and if it were raiſed we ſhould not ſee any thing of the ſides AB or CD, but only the front AD: the reaſon is, that the point of view E being directly oppoſite thereto, cauſes a diminution on each ſide; which however is only to be underſtood where an elevation is the object; for if it be a plan, it ſhews the whole, as ABCD.

The point of oblique view, is when we ſee an object aſide of us, and as it were aſlant, or with the corner of the eye; the eye, however, being all the while oppoſite to the point of ſight; in which caſe, we ſee the object laterally, and it preſents to us two ſides or faces.

For inſtance, if the point of ſight be in F, (*ibid.* fig. 8.) the object GHIK will appear athwart, and ſhew two faces GK and GH, in which caſe it will be a ſide point.

We ſhall now give ſome examples, by which it will appear, that the whole practice of perſpective is built upon the foundation already laid down. Thus, to find the perſpective appearance of a triangle ABC (*ibid.* fig. 9.) between the eye and the triangle draw the line DE, which is called the fundamental line; from 2 draw 2 V, repreſenting the perpendicular diſtance of the eye above the fundamental line, be it what it will; and through V draw, at right angles to 2 V, HK parallel to DE: then will the plane DHKE repreſent the tranſparent plane on which the perſpective repreſentation is to be made. Next to find the perſpective points of the angles of the triangle, let fall perpendiculars A 1, C 2, B 3, from the angles to the fundamental DE: ſet off theſe perpendiculars upon the fundamental oppoſite to the point of diſtance K, to B, A, C; from 1, 2, 3, draw lines to the principal point V; and from the points A, B, and C, on the fundamental line, draw the right lines AK, BK, CK, to the point of diſtance K, which is ſo called, becauſe the ſpectator ought to be ſo far removed from the figure or painting, as it is diſtant from the principal point V. The points *a*, *b*, and *c*, where the viſual lines V 1, V 2, V 3 interſect the lines of diſtance AK, BK, CK, will be the angular points of the angle *a b c*, the true repreſentation of ABC.

To draw a ſquare pavement in perſpective. See fig. 10, and 11. of Plate CXLIII.

Suppoſe your piece of pavement to conſiſt of 64 pieces of marble, each a foot ſquare. Your firſt buſineſs is, to draw an ichnographical plan or ground-plot of it, which is thus performed. Having made an exact ſquare of the ſize you intend your plan, divide the baſe and horizon into eight equal parts; and from every diviſion in the baſe to its oppoſite point in the horizon, rule perpendicular lines: then divide the ſides into the ſame number, ruling parallel lines acroſe from point to point: ſo will your pavement be divided into 64 ſquare feet; becauſe the eight feet in length, multiplied by the ſame in breadth, give the number of ſquare feet or pieces of marble contained in the whole: then rule diagonals from corner to corner; and thus will your ground-plot appear as in fig. 10.

Now, to lay this in perſpective, draw another ſquare to your intended ſize, and divide the baſe line AB into eight equal parts, as before; then fix your point of ſight C in the middle of the horizon DE, and from the ſame point rule lines to every diviſion in the baſe AB; after which, rule diagonal lines from D to B, and from E to A, anſwerable to thoſe in the ground-plot, and your ſquare will be reduced to the triangle ABC; then from the point F, where the diagonal DB interſects the line AC, to the oppoſite interſection G, where the diagonal EA croſſes the line CB, rule a parallel line, which is the abridgment of the ſquare.

Then through the points where the diagonals croſs the reſt of the lines which go from the baſe to the point of ſight, rule parallel lines, and your ſquare pavement will be laid in perſpective, as in fig. 11.

To diminiſh a ſquare viewed by the angle D. See Plate CXLIII. fig. 12.

Having deſcribed the plane ABCD, draw a line to touch


Phasianus Gallus
or common Cock & Hen.


Pavo cristatus
or Peacock.
Hen.

or rase the angle B, and falling perpendicularly on BD.

This being continued as a base line, lay your ruler on the side of the square AD and DC, and where the ruler cuts the terrestrial line make the points H,I.

Then from H and B draw lines to the point of distance P, and from I draw a line to the other point of distance G; and in the intersection of those lines, make points, which will give you the square KLMB.

To do without the plan: set off the diameter each way from the middle point B, as to H and I. But in either case no line is to be drawn to the point of sight O.

To diminish a Circle. See Plate CXLIII. fig. 13.

Draw a square ABCD about it, and from the angles AD and CB draw diagonals, dividing the circle into eight parts, and through the points where they cut it OO, draw lines from the base line perpendicular to DEF.

Then draw two diagonals QR, SP, intersecting each other at right angles in the centre G.

Having thus disposed the plan, draw lines from all the perpediculars to the point of sight H; and where they are intersected by the diagonals AK and BI, make points; the two last of which M,N give the square, which is to be divided into four by diagonals, intersecting each other in the point P.

In the last place, from the extremes of this cross, draw curve lines through the said points, which will give the form of the circle in *perspective.*

Of the measures upon the base in perspective, Pl. CXLIV.

By the base line alone any depth may be given, and in any place at pleasure, without the use of squares; which is a very expeditious way.

As for example, suppose the base line BS, (fig. 1.) the point of view A, and the points of distance DE; if now you would make a plan of a cube BC, draw two occult or dotted lines from the extremes BC to the point of sight; then to give the breadth, take the same measure BC, and set it off on the terrestrial line CF, and from F draw a line to the point of distance D; and where this line intersects the first ray C in the point G, will be the diminution of the plan of the cube BHGC.

If you would have an object farther towards the middle, take the breadth, and the distance of the base line, as IK; and to have the depth, set it as you would have it on the same base as LM, and its width both on LM. Then from L and M draw occult lines to the point of distance D, and from the points NO, where those lines intersect the ray K, draw parallels to the terrestrial line, and you will have the square QPON.

After the same manner you may set off the other side of the square which should be on the base, as BHGC is here transferred to V. The points M and T, which are only two feet from the point S, afford a very narrow figure in K, as being very near.

Of the base line, and a single point of distance.

Since the depths and widths may be had by the means of this base line, there is no need of any further trouble in making of squares; as shall be shewn in this example.

Suppose a row of trees or columns is to be made on each side; on the base line lay down the place, and the distance between them, with their breadth or diameters, as ABCDEFG; then laying a ruler from the point of distance O to each of the points ABCDEFG, the intersections it makes on the visual ray AH will be the bounds of the objects desired. Fig. 2.

To set them off on the other side upon the ray GH, set one foot of the compasses upon the point of the eye H, and with the other strike an arch; the point wherein this cuts the ray GH, will be the corresponding bound.

Thus M will be the same with N, and so of the rest; through which drawing parallels, you will have the breadths.

And as for the length, you may make it at pleasure: setting it off from A, as for instance, to P, and then from P drawing a line to H; and where this cuts the other parallels, will be formed the plan required; which you may make either round or square.

To find the height and proportion of any objects, as they appear above the horizon on a supposed plane. See Plate CXLIV. fig. 3.

First rule your horizontal line NO, and fix your point of sight, as at M; then mark the place of your nearest pillar, by making a dot for the base or bottom, as at A; and another for the summit or top, as at B: rule a line from A to the point of sight M, and another from B to M, and these two lines will give the height of any number of pillars. As for example: Suppose you would have a pillar at C, fix your dot for the base, and rule from thence a parallel line to meet the diagonal AM at D: then rule the perpendicular DE to the diagonal BM: which perpendicular is the height of your figure required at C. Or, if you would place pillars at F and I, observe the same method, ruling the parallels FG and IK, and the perpendiculars GH and KL will give their heights at the distances required.

To find the diameter or thickness of pillars at any particular distances, you are also to be guided by that nearest the base. For instance: Suppose your nearest pillar AB to be ten feet high, and one foot in diameter: divide it from top to bottom into ten equal parts, and set off one of them upon the base of the pillar: then rule a line from the point of sight M to the diameter P, and you will have the thickness of all your pillars on their respective parallels or bases.

The same rule exemplified in objects below the horizon. See Plate CXLIV. fig. 4.

If you would know the heights of a number of figures below the horizon, rule your horizontal line QR, and fix your point of sight, as at P: then place your nearest figure, or mark the dots for the head and feet, by the points A and B, which answers the same purpose; and rule from these dots to the point of sight the lines AP and BP: and if you would find the height of a figure to be drawn at *c*, rule from thence the parallel *cd* to the diagonal BP, and the perpendicular *de* will give the height required. The same directions will shew the height of a figure at any other distance you have a mind to place it, as at *f*, *i*, and *m*, by ruling the parallels *fg*, *ik*, and *mn*; and from each of these their respective perpendiculars *gh*, *kl*, and *no*; which perpendiculars will shew the heights of the figures at *f*, *i*, and *m*.

4. *To draw a direct view.* See Plate CXLIV. fig. 4.

To illustrate this example, suppose you were to draw the inside of a church, as represented in this figure: First take your station at the point A, in the centre of the base line

BC: from which you have a front view of the whole body of the church, with all the pillars, *&c.* on each side: then fix your horizon at any height you think proper, as at DE: bisect it by the perpendicular EA: and where these two lines intersect, is the point of sight F. This perpendicular will pass through the centres of all the arches in the dome or cupola: which centres may be found by any three given points. Next divide your base line into any given number of feet; and the visual lines, ruled from these divisions to the point of sight, will reduce all your objects to their just proportion, by setting off their height upon a perpendicular raised at their respective distances. The base, in the example here given, is divided into twelve equal parts of five feet each; from which (supposing your front column to be 35 feet high) take seven divisions from the base line of your drawing, and set them off upon the perpendicular GH; then (supposing this column to be five feet thick at the base) set off one of those divisions upon the parallel IK, which is the breadth required. So that, by proportioning this scale to any distance by the foregoing directions, you may not only find the dimensions of all your columns, but also of every distinct part of them, as well as of all the doors, windows, and other objects that occur. For instance: Having found the height and breadth of your first or nearest column G, draw from the top and bottom of the said column to the point of sight the lines HF and KF; after which, rule the line IF from the base of the column to the point of sight, and you have the height and breadth of all the rest of the columns, as has been already shewn in fig. 3.

By ruling lines from the points *a,b,c,d,* &c. to the point of sight, you will see that all the summits and bases of your columns, doors, windows, *&c.* must tend immediately to that point; and by lines drawn from the points 1,2,3, 4, *&c.* on each side, to the correspondent points on the opposite side, may be seen all the parts of your building lying upon the same parallel.

To draw an oblique view. See fig. 6. of Plate CXLIV.

First draw your horizontal line AB; then, if your favourite object be on the right hand, as at C, place yourself on the left hand upon the base line, as at D; then from that station erect a perpendicular DE, which will pass through the horizon at the point of sight F; to which rule the diagonals GF and HF, which will shew the roof and base of your principal building C, and will also, as before directed, serve as a standard for all the rest.

Observe also, either in direct or oblique views, whether the prospect before you make a curve; for if it does, you must be careful to make the same curve in your drawing.

To draw a perspective view, wherein are accidental points. See fig. 7. of Plate CXLIV.

Rule your horizontal line *ab*, and on one part of it fix your point of sight, as at *c*; from which rule the diagonals *cd* and *ce* on the one side, and *cf* and *cq* on the other; which will shew the roofs and bases of all the houses in the street directly facing you; (supposing yourself placed at A in the centre of the base line:) Then fix your accidental points *g* and *h* upon the horizontal line, and rule from them to the angles *ik* and *lm*, (where the streets on each side take a different direction, towards the accidental points *g* and *h*) and the lines *gi* and *gk* give the roofs and bases of all the buildings on one side, as *lh* and *mh* do on the other.

Accidental points seldom intervene where the distance is small, as in noblemens seats, groves, canals, *&c.* which may be drawn by the strict rules of perspective: but where the prospect is extensive and varied, including mountains, bridges, castles, rivers, precipices, woods, cities, *&c.* it will require such an infinite number of accidental points, that it will be better to do them as nature shall dictate, and your ripened judgment approve.

To find the centre for the roof of a house, in an oblique view. See fig. 8. of Plate CXLIV.

Suppose from the point of sight A, the visual lines AB and AC be drawn, BC being one perpendicular given, and DE the other, rule the diagonals from D to C, and from E to E, and the perpendicular FG, raised through the point of their intersection, will shew the true centre of the roof, as will appear by ruling the lines GE and GC.

For want of being acquainted with this necessary rule, many who have been well versed in other parts of perspective, have spoiled the look of their picture, by drawing the roofs of their houses out of their true perpendicular.

We shall conclude by giving a few practical rules. 1. Let every line, which in the object, or geometrical figure, is straight, perpendicular, or parallel to its base, be so also in its scenographic delineation. 2. Let the lines, which in the object return at right angles from the fore-right side, be drawn scenographically from the visual point. 3. Let all straight lines, which in the object return from the fore-right side, run in a scenographic figure into the horizontal line. 4. Let the object you intend to delineate, standing on your right-hand, be placed also on the right hand of the visual point; and that on the left-hand, on the left-hand of the same point; and that which is just before, in the middle of it. 5. Let those lines which are (in the object) equidistant to the returning line be drawn in the scenographic figure, from that point found in the horizon. 6. In setting off the altitude of columns, pedestals, and the like, measure the height from the base line upwards, in the front or fore-right side; and a visual ray down that point in the front shall limit the altitude of the column or pillar, all the way behind the fore-right side, or orthographic appearance, even to the visual point. This rule you must observe in all figures, as well where there is a front or fore-right side, as where there is none. 7. In delineating ovals, circles, arches, crosses, spirals, and cross-arches, or any other figure in the roof of any room, first draw ichnographically, and so with perpendiculars from the most eminent points thereof, carry it up unto the cieling; from which several points, carry on the figure. 8. The centre in any scenographic regular figure is found by drawing lines from opposite angles: for the point where the diagonals cross, is the centre. 9. A ground-plane of squares is alike, both above and below the horizontal line; only the more it is distant above or beneath the horizon, the squares will be so much the larger or wider. 10. In drawing a perspective figure, where many lines come together, you may, for the directing of your eye, draw the diagonals in red; the visual lines in black; the perpendiculars in green, or other different colour, from that which you intend the figure shall be of. 11. Having considered the height, distance, and position of the figure, and drawn it accordingly, with side or angle against the base; raise perpendiculars from the several angles, or

Plate CXLIII

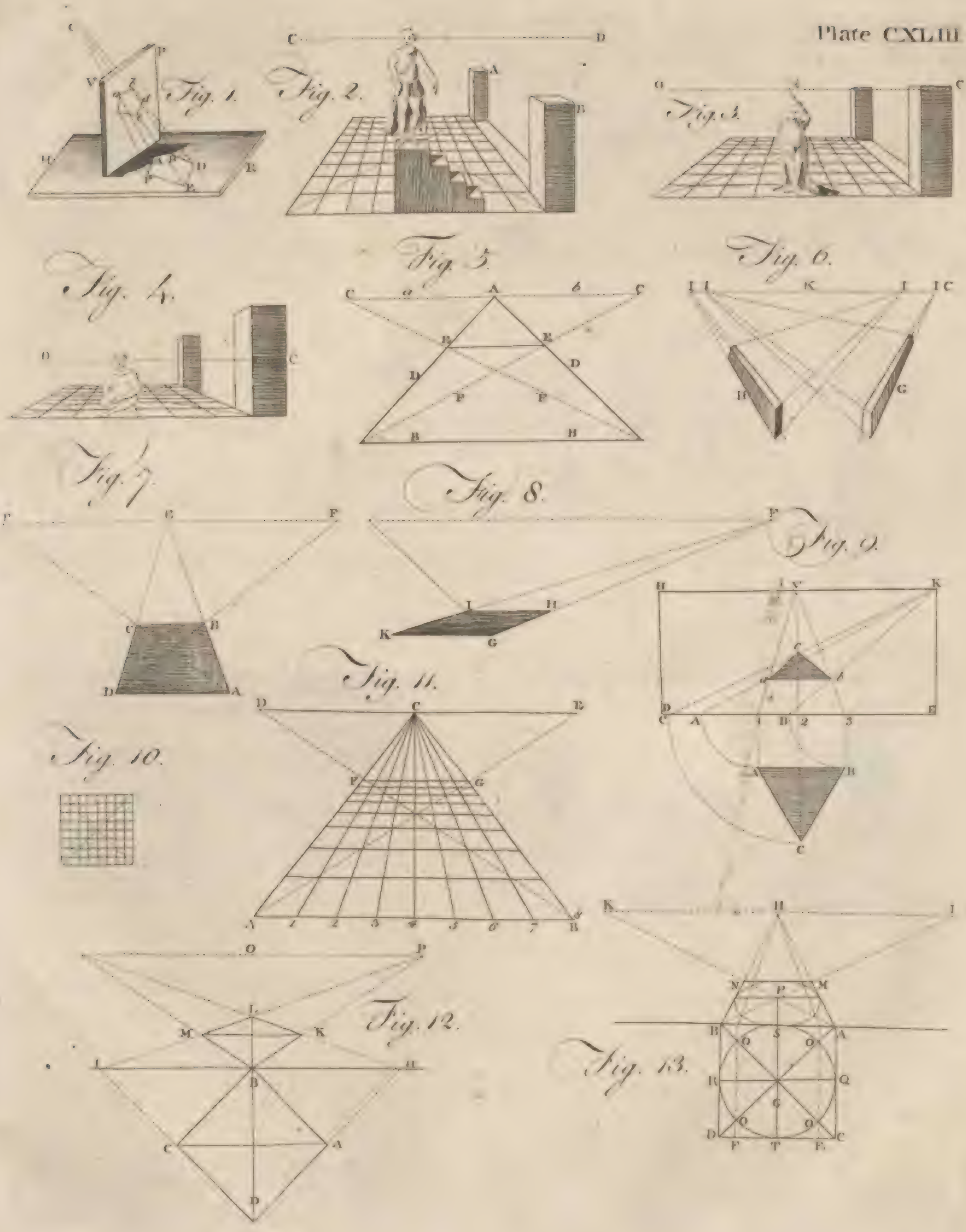


Fig. 1.

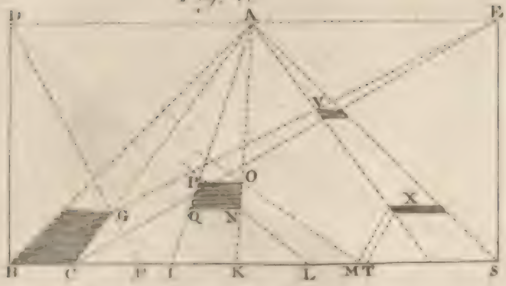


Fig. 2.

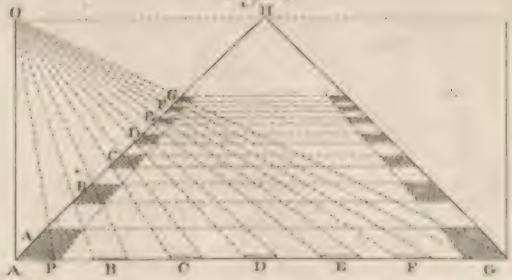


Fig. 3.

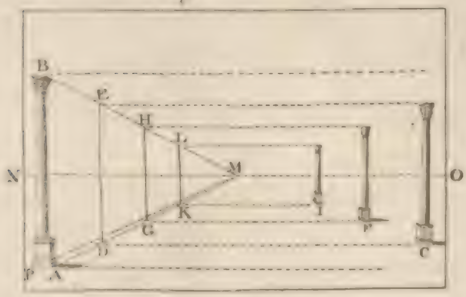


Fig. 4.

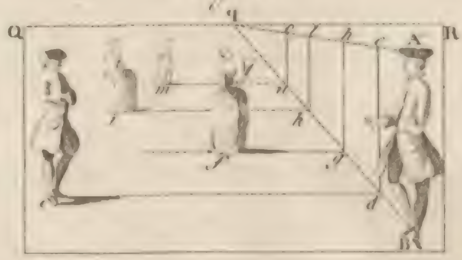
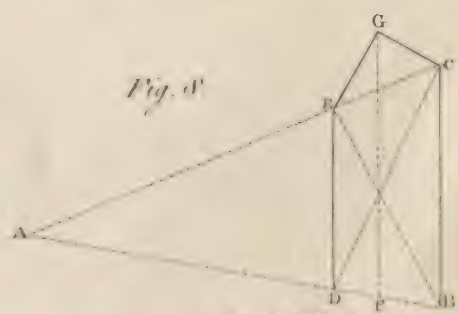


Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.



Bell sc.

or designed points, from the figure to the base, and transfer the length of each perpendicular, from the place where it touches the base, to the base on the side opposite to the point of distance; so will the diametrals drawn to the perpendiculars in the base, by intersection with the diagonals, drawn to the several transferred distances, give the angles of the figures, and so lines drawn from point to point will circumscribe the scenographic figure. 12. If in a landskip there be any standing-waters, as rivers, ponds, and the like, place the horizontal line level with the farthest sight or appearance of it. 13. If there be any house, or the like, in the picture, consider their position, that you may find from what point in the horizontal lines to draw the front and sides thereof. 14. In describing things at a great distance, observe the proportion, both in magnitude and distance, in draught, which appears from the object to the eye. 15. In colouring and shadowing of every thing, you must do the same in your picture, which you observe with your eye, especially in objects lying near; but, according as the distance grows greater and greater, so the colours must be fainter and fainter, till at last they lose themselves in a darkish sky-colour. 16. The catoptrics are best seen in a common looking-glass, or other polished matter; where, if the glass be exactly flat, the object is exactly like its original; but, if the glass be not flat, the resemblance alters from the original; and that more or less, according as the glass differs from an exact plane. 17. In drawing catoptric figures, the surface of the glass is to be considered, upon which you mean to have the reflection: for which you must make a particular ichnographical draught, or projection; which on the glass must appear to be a plane full of squares, on which projection transfer what shall be drawn on a plane, divided into the same number of like squares; where though the draught may appear very confused, yet the reflection of it on the glass will be very regular, proportional, and regularly composed. 18. The dioptric, or broken beam, may be seen in a tube through a crystal or glass, which hath its surface cut into many others, whereby the rays of the object are broken. For to the flat of the crystal, or water, the rays run straight; but then they break and make an angle, which also by the refracted beams is made and continued on the other side of the same flat. 19. When these faces on a crystal are returned towards a plane placed directly before it, they separate themselves at a good distance on the plane; because they are all directed to various far distant places of the same. See OPTICS.

PERSPECTIVE GLASS, in optics, differs from a telescope in this: instead of the convex eye-glass placed behind the image, to make the rays of each pencil go parallel to the eye, there is placed a concave eye-glass as much before it; which opens the converging rays, and makes them emerge parallel to the eye. See OPTICS.

PERSPIRATION, in medicine, the evacuation of the juices of the body through the pores of the skin. Perspiration is distinguished into sensible and insensible: and here sensible perspiration is the same with sweating, and insensible perspiration that which escapes the notice of the senses; and this last is the idea affixed to the word perspiration when used alone.

The matter of insensible perspiration, is a fine subtle fluid, which exhales from the body in the form of a vapour, and proceeds from the whole surface and from every cavity; it is of an aqueous and saline nature, and seems to have a great analogy with urine; because in a healthy state, the increase of the one diminishes the other. Many experiments prove its existence. Sanctorius found, in Italy, under the circumstances of a moderate diet, middle age, and easy life, that the matter insensibly perspired was five-eights of that taken in for food; so that there only remained three-eights for nutrition, and for the excrements of the nose, ears, intestines, bladder, *&c.* The same author shews, that as much is evacuated by perspiration in one day, as by stool in fourteen days.

But Dr. Bryan Robinson, of Dublin, has found the case very different, both in England and Ireland, and even in South Carolina, in all which places he found that the quantity of urine exceeds that of perspiration; and that if the meat and drink of one day be four pounds and a half, the perspiration of that day will be two pounds, the urine two pounds five ounces, and the stool three ounces.

The matter of sweat is separated from the blood by the miliary glands, and is therefore much more gross than that of insensible perspiration; for as there are no glands which serve for the excretion of this last fluid, it is supposed to proceed from the extremities of the capillary arteries.

The use of perspiration is to preserve the suppleness of the papillæ of the skin; to carry the saline particles off from the blood, and by this means to render it more pure; to preserve the body from various diseases; and to contribute to the cure of the most dangerous distempers. It may be promoted by exercise, by dry frictions with a coarse linen-cloth or a flesh-brush, by warm baths, and washing the hands, feet, head, *&c.*

PERTH, the capital of the county of the same name in Scotland, thirty miles north of Edinburgh.

PERTHAMBOY, a port-town of New-Jersey, in North America: W. long. 74°. N. lat. 40° 45′.

PERTINENT OF LANDS, in Scots law. See LAW, Tit. xiii. 18.

PERU, formerly a powerful empire in South America, but now a province of Spain, is situated between 60° and 81° of west longitude, and between the equator and 25° of south latitude, being near 2000 miles in length from north to south, and from 200 to 500 broad: it is bounded by Popayan, on the north; by the mountains of Andes, on the east; by Chili and La Plata, on the south; and by the Pacific Ocean, on the west.

PERUGIA, a city of Italy, in the territories of the pope: E. long. 13° 16′, N. lat. 43°.

PERUVIAN BARK. See CINCHONA.

PESARO, a city of Italy, in the province of Urbino, situated on the gulph of Venice: E. long. 14°, N. lat. 44°.

PESSARY, in medicine, a solid substance composed of wool, lint, or linen, mixed with powder, oils, wax, *&c.* made

made round and long like a finger, in order to be introduced into the exterior neck of the matrix, for the cure of several disorders incident to the uterus.

PEST, a city of upper Hungary, situated on the Danube: E. long. 19° 15′, N. lat. 47° 42′.

PESTILENCE, in medicine. See MEDICINE, p. 71.

PETAL, among botanists. See BOTANY, p. 637.

PETALISM, in antiquity, a kind of banishment practised at Syracuse, by writing the person's name on a leaf; whence the name.

PETARD, in the art of war. See GUNNERY, p. 761.

PETACITES, in botany. See TUSSILAGO.

PETECHIÆ, in medicine, denotes spots in the skin like flea-bites, which come out in malignant fevers, hence called petechial or spotted fevers. See MEDICINE, p. 67.

PETER, or *Epistles of St.* PETER, two canonical books of the New Testament, written by the apostle St. Peter, and addressed to those Jewish converts who were scattered throughout Pontus, Galatia, *&c.* not only upon the persecution raised at Jerusalem, but upon former dispersions of the Jews into those places. The first of these epistles is principally designed to comfort and confirm them, under those fiery trials they were then subject to; and to direct them how to behave in the several states and relations, both of the civil and the Christian life. In the second epistle, the apostle prosecutes the same subject, to prevent their apostacy from the faith, and guard them against the corrupt principles of the gnostics, and those who scoffed at the promise of Christ's coming.

St. PETER'S DAY, a festival of the Christian church, observed on the twenty-ninth of June.

PETERBOROUGH, a city of Northamptonshire, situated on the river Nen, thirty-four miles north-east of Northampton: W. long. 15′, N. lat. 52° 53′. It sends two members to parliament.

PETER-PENCE, an ancient tax of a penny on each house, paid to the pope.

It was called peter-pence because collected on the day of St. Peter *ad vincula*, and sent to Rome; whence it was also called Rome-scot and Rome-penny.

PETERSBURG, the capital city of Russia, and one of the largest and most populous cities in the world, situated on both sides the river Nieva, in the provinces of Carelia and Ingria, between the gulph of Finland and the lake of Ladoga: E. long. 31°, N. lat. 60°. There were no less than sixty-five thousand houses built within three or four years after the foundation was laid, which was in the year 1703.

PETERSFIELD, a borough-town of Hampshire, fifteen miles south-east of Winchester.

PETERSHAGEN, a town of Germany, in the circle of Westphalia and duchy of Minden, thirty-seven miles west of Hanover: subject to Prussia.

PETHERTON, a market-town of Somersetshire, 16 miles south-west of Wells.

PETIOLE, in botany, the slender stalks that supports the leaves of a plant.

PETITGUAVES, a port-town of Hispaniola, situated on a bay at the west end of the island: W. long. 76°, N. lat. 18° 5′: subject to France.

PETITIO PRINCIPII, in logic, the taking a thing for true, and drawing conclusions from it as such; when it is really false, or at least wants to be proved, before any inferences can be deduced from it.

PETITORY ACTION, in Scots law. See LAW, Tit. xxx. 18.

PETITVERIA, in botany, a genus of the hexandria tetragynia class. The calix consists of four segments; it has no corolla; and but one seed with reflected prickles at the point. There are two species, none of them natives of Britain.

PETRE, or SALT PETRE. See CHEMISTRY, p. 73, 119.

PETREA, in botany, a genus of the didynamia angiospermia class. The calix is large, open, coloured, and divided into five segments; the corolla is open and rotated. There is but one species, a native of America.

PETRIDIA, in natural history, a genus of scrupi, of a plane, uniform structure, of no great variety of colours, and emulating the external form of pebbles.

PETRIFACTION, in physiology, denotes the conversion of wood, bones, and other substances into stone.

The fossile bodies found petrified are principally either of vegetable or animal origin, and are more or less altered from their original state, according to the different substances they have lain buried among in the earth; some of them having suffered very little change, and others being so highly impregnated with crystalline, sparry, pyritical, or other extraneous matter, as to appear mere masses of stone or lumps of the matter of the common pyrites; but they are generally of the external dimensions, and retain more or less of the internal figure of the bodies into the pores of which this matter has made its way.

The animal substances thus found petrified are sea-shells; the teeth, bony palates, and bones of fish; the bones of land animals, *&c.* These are found variously altered, by the insinuation of stony and mineral matter into their pores; and the substance of some of them is now wholly gone, there being only stony, sparry, or other mineral matter remaining in the shape and form.

PETROBRUSSIANS, in church-history, a religious sect which arose in France and the Netherlands, about the year 1126, so called from their leader Peter Bruys. They denied that children, before the use of reason, can be justified by baptism. They also condemned all places of public woship, crosses, crucifixes; and are said to have rejected the sacrament of the eucharist, and prayers for the dead.

PETROLEUM, also called rock-oil, is an extremely subtle and penetrating fluid, and is much the thinnest of all the native bitumens. It is very light and very pellucid; but though equally bright and clear under all circumstances, it is liable to a very great variety in its colour. It is naturally almost colourless, and in its appearance grealy resembles the most pure oil of turpentine: this is called white petroleum, though it has no more colour than water; it is sometimes tinged of a brownish reddish, yellowish, or faint greenish colour; but its most frequent colour is a mixture of the reddish and blackish, in such a degree that it looks black when viewed behind the light, but purple when placed between the eye and a candle or window. It is of a pungent and acrid taste, and of a very strong and penetrating smell, which very much approaches to that of the distilled oil of amber. The white

is

is moſt eſteemed. It is ſo very inflammable, that while it floats on the ſurface of the water, as it does in many parts of Italy, it takes fire at the approach of a candle.

Petroleum is found in rivers, in wells, and trickling down the ſides of hills along with little ſtreams of water. In ſhort, it is the moſt frequent of all the liquid bitumens, and is perhaps the moſt valuable of them all in medicine. It is to be choſen the pureſt, lighteſt, and moſt pellucid that can be had, ſuch as is of the moſt penetrating ſmell and is moſt inflammable.

It is principally uſed externally, in paralytic caſes, and in pains of the limbs.

PETROMYZON, in ichthyology, a genus belonging to the amphibia nantes claſs. It has ſeven ſpiracula at the ſide of the neck, no gills, a fiſtula on the top of the head, and no breaſt or belly fins. There are three ſpecies, diſtinguiſhed by peculiarities in the back-fins.

PETROSA OSSA, in anatomy. See ANATOMY, p. 295, *&c.*

PETTAW, a city of Germany, in the circle of Auſtria: E. long. 16° 8′, N. lat. 47°.

PETTIPOLI, a port-town on the coaſt of Cormandel, in the hither India, where the Dutch have a factory: E. long. 80°, N. lat, 16° 45′.

PETUNSE, in natural hiſtory, one of the two ſubſtances whereof the porcelain or china-ware is made.

The petunſe is a coarſe kind of flint or pebble, the ſurface of which is not ſo ſmooth, when broken, as that of our common flint.

PEUCEDANUM, in botany, a genus of the pentandria digynia claſs. The fruit is oval, ſtreaked on each ſide, and ſurrounded with a wing; and the involucrum is very ſhort. There are five ſpecies, two of them natives of Britain, *viz.* the officinale, or hogs-fennel, the root of which is recommended in diſorders of the breaſt; and the minus, or rock-parſley.

PEWTER, a factitious metal, uſed in making domeſtic utenſils, as plates, diſhes, *&c.*

The baſis of this metal is tin, which is converted into pewter, by mixing at the rate of an hundred weight of tin with fifteen pounds of lead and ſix pounds of braſs. See METAL.

Beſides this compoſition, which makes the common pewter, there are other kinds compounded of tin, regulus of antimony, biſmuth and copper, in ſeveral proportions.

PEZIZA, in botany, a genus of the cryptogamia fungi claſs. It is ſeſſile and bell ſhaped. There are eight ſpecies, ſix of them natives of Britain.

PHACA, in botany, a genus of the diadelphia decandria claſs. The legumen or pod is ſomewhat bilocular. There are three ſpecies, none of them natives of Britain.

PHÆNOMENON, in philoſophy, denotes any remarkable appearance, whether in the heavens or on earth; and whether diſcovered by obſervation or experiments.

PHAGEDÆNA, denotes a corroding ulcer.

PHAGEDÆNIC MEDICINES, thoſe uſed to eat of fungous or proud fleſh: ſuch are all the cauſtics.

PHALÆNA, in zoology, a genus of inſects belonging to the order of lepidoptera. The feelers are ſetaceous, and taper gradually to the points; the wings are often bent backwards; and the ſpecies of this genus fly about in the night. There are no leſs than 460 ſpecies, conprehending all the moths.

PHALANGIUM, in zoology, a genus of inſects belonging to the order of aptera. They have eight feet, two eyes on the top of the head placed very near each other, and other two on the ſides of the head; the feelers reſemble legs; and the belly is round. There are nine ſpecies.

PHALANGIUM, in botany. See ANTHERICUM.

PHALANX, in Grecian antiquity, a ſquare battalion, conſiſting of eight thouſand men, with their ſhields joined, and pikes croſſing each other; ſo that it was next to impoſſible to break it.

PHALARIS, in botany, a genus of the triandria digynia claſs. It has two carinated valves, of equal lengths, and including the corolla. There are 10 ſpecies, three of them natives of Britain, *viz.* the canarienſis, or manured canary-graſs; the arenaria, or ſea canary-graſs; and the arundinacia, or reed canary-graſs.

PHALEUCIAN VERSE, in ancient poetry, a kind of verſe which conſiſts of five feet, the firſt of which is a ſpondee, the ſecond a dactyl, and the three laſt trochees.

PHALLUS, in botany, a genus of the cryptogamia fungi claſs. It is woven like a net above, and ſmooth below. There are two ſpecies, both natives of Britain, *viz.* the eſculentus, or eſculent morel; and the impudicus, or ſtinking morel.

PHANATIC, or FANATIC, a term of reproach formerly given to the diſſenters, from a falſe ſuppoſition that they pretended to viſions, *&c.*

PHANTASM, a term ſometimes uſed in a ſynonymous ſenſe with idea, or the notion retained in the mind of an external object.

PHARISEES, a famous ſect of the Jews, who diſtinguiſhed themſelves by their zeal for the traditions of the elders, which they derived from the ſame fountain with the written word itſelf; pretending that both were delivered to Moſes from Mount Sinai, and were therefore both of equal authority. From their rigorous obſervance of theſe traditions, they looked upon themſelves as more holy than other men, and therefore ſeparated themſelves from thoſe whom they thought ſinners or prophane, ſo as not to eat or drink with them; and hence, from the Hebrew word *pharis*, which ſignifies to ſeparate, they had the name of Phariſees or Separatiſts.

PHARMACY, the art which teaches the election, preparation, and mixture of medicines; conſtituting one part of the therapeutic branch of medicine, the objects of which are all natural bodies.

PHARNACEUM, in botany, a genus of the pentandria trigynia claſs. The calix conſiſts of five leaves; it has no corolla; and the capſule has three cells, containing many ſeeds. There are five ſpecies; none of them natives of Britain.

PHAROS, a ſmall iſland in the mediterranean ſea, oppoſite to Alexandria, in Egypt.

PHAROS, or PHARE, a LIGHT-HOUSE, a pile raiſed near a port, where fire is kept burning in the night, to guide and direct veſſels near at hand.

PHARSALUS, a town of ancient Theſſaly, ſituated in European Turky, a little ſouth of Lariſſa, in E. lon. 23°, and N. lat. 39°.

PHARYNX, in anatomy. See ANATOMY, p. 302.

PHASCUM, in botany, a genus of the cryptogamia musci class. The antheræ are operculated, and the calyptra is wanting. There are four species, all natives of Britain.

PHASEOLOUS, in botany, a genus of the diadelphia decandria class. The carina, stamina, and stylus, are twisted like a screw. There are 13 species, none of them natives of Britain.

PHASES, in astronomy, the several appearances or quantities of illumination of the moon, venus, mercury, and the other planets. See ASTRONOMY.

PHASIANUS, in ornithology, a genus belonging to the order of gallinæ. The cheeks are covered with a smooth naked skin. There are six species, *viz.* 1 The gallus, or dunghill cock and hen, with a compressed caruncle or fleshy-comb on the top of the head, and a couple of caruncles or wattles under the chin; the ears are naked; and the tail is compressed, and erected. This bird, though now one of the domestic fowls, was originally brought from the East-Indies. They feed upon grain, grass-seeds, and worms. The cock or male is perhaps the boldest and most heroic of all the feathered tribe. He claps his wings before he sings or crows. He begins to crow about midnight, and seldom ceases till break of day. He is so exceedingly salacious, that one cock is sufficient for 10 hens His sight is very piercing, and he never fails to cry in a peculiar manner when he discovers any bird of prey in the air. The hen is very prolific: she makes her nest on the ground; and the young, immediately after they are hatched, follow her, and pick up their food themselves. There are six or eight varieties of this species. 2. The motmot, or Guinea pheasant, is brownish, somewhat red below, with a wedge-like tail, and wants spurs It is a native of Guinea and Brasil. 3. The colchicus, is red, with a blue head, a wedge shaped tail, and papillous cheeks. It is a native of Asia. 4. The argus is yellowish, with black spots, a red face, and a blue crest on the back part of the head. It is found in Chinese Tartary. 5. The pictus, has a yellow crest, a red breast, and a wedge-shaped tail. It is a native of China. 6. The nycthemerus, is white, with a black crest and belly, and a wedge-shaped tail. It is a native of China. See Plate CXLII.

PHASMATA, in physiology, certain appearances arising from the various tinctures of the clouds, by the rays of the heavenly luminaries, especially the sun and moon. These are infinitely diversified by the different figures and situation of the clouds, and the appulses of the rays of light.

PHASSACHATES, in natural history, the name of a species of agate, which the ancients, in its different appearances, sometimes called also leucachates and perileucos. See AGATE.

PHEASANT, in ornithology. See PHASIANUS.

PHELLANDRIUM, in botany, a genus of the pentandria digynia class. The fruit is oval and smooth. There are two species, one of them, *viz.* the aquaticum, or water hemlock, is a native of Britain.

PHELYPÆA, in botany. See LATHRÆA.

PHENICIA, a subdivision or province of Syria, situated on the Levant, or eastern part of the Mediterranean sea, on the confines of Palestine

PHEONS, in heraldry, the barbed heads of darts, arrows, or other weapons, and usually represented as in Plate CXLV. fig. 1.

PHIDITIA, in Grecian antiquity, feasts celebrated with great frugality at Lacedæmon. The phiditia were held in the public places, and in the open air: rich and poor assisted at them alike, and on the same footing; their design being to keep up peace, friendship, and a good understanding and equality among all the citizens, great and small. It is said, that they who attended this feast, brought each a bushel of flour, eight measures of wine named chorus, five minæ of cheese, and as much figs.

PHILADELPHIA, the capital of the province of Pensilvania, in North America, situated on the rivers Delawar and Schoolkill: W long. 74°, N. lat. 40° 50′.

PHILADELPHIA is also the name of an ancient town of the Lesser Asia, situated in E. long. 29°, N. lat. 38°.

PHILADELPHUS, in botany, a genus of the icosandria monogynia class. The calix consists of four or five segments, and the corolla of four or five petals; and the capsule has four or five cells, containing many seeds. There are two species, none of them natives of Britain.

PHILIP-FORT, a fortress in Dutch Brabant, situated on the east side of the Scheld, opposite to Pearl-fort, five miles north-west of Antwerp.

PHILIPPI, an ancient town of Macedonia, a province of European Turky, situated in E. long. 25°, N lat. 41°.

PHILIPPICS, in literature, a name given to the orations of Demosthenes against Philip king of Macedon; being esteemed the master-pieces of that great orator.

Philippic is also a term applied to the fourteen orations of Cicero against Mark Anthony.

PHILIPPINE ISLANDS, are situated in the Pacific ocean, in Asia, between 114° and 131° east longitude, and between 5° and 19° north latitude: there are a great number of them, and some very large.

PHILIPPINES, a religious society of young women, at Rome; so called from their taking St. Philip de Neri for their protector: they consist of an hundred poor girls, who are brought up till they are of age to be married, or become nuns, under the direction of some religious women, who teach them to read, write, and work; and instruct them in the duties of Christianity. They wear a white veil, and a black cross on their breasts.

PHILIPPOPOLI, a city of European Turky, in the province of Romania, situated on the river Mariza: in E. long. 25°, and N lat. 42° 20′.

PHILIPSBURGH, a city of Germany, in the palatinate of the Rhine situated on the east bank of the river Rhine, in E long. 8° 16′, N. lat. 49° 8′.

PHILIPSTAT, a town of Sweden, in the province of Gothland and territory of Wermeland, situated in E. long. 14°. N. lat 59° 50′.

PHILLYREA, in botany, a genus of the diandria monogynia class. The corolla consists of four segments, and the berry contains four seeds. There are three species, none of them natives of Britain.

PHILOLOGY, a science, or rather assemblage of several sciences, consisting of grammar, rhetoric, poetry, antiquities, history, and criticism.

Phylology is a kind of universal literature, conversant about all the sciences, their rise, progress, authors, &c. It makes what the French call the *belles lettres*.

PHILOMATHES, a lover of learning or science.

PHILONIUM,

PHILONIUM, in pharmacy, a kind of somniferous anodyne opiate, taking its name from Philo the inventor.

PHILOSOPHER, a person versed in philosophy; or one who makes profession of, or applies himself to, the study of nature and morality.

PHILOSOPHER'S STONE, the greatest object of alchymy, is a long sought for preparation, which, when found, is to convert all the true mercurial part of metal into pure gold, better than any that is dug out of the mines, or perfected by the refiner's art; and this only by casting a little quantity thereof upon metals in fusion, whilst that part of the metal which was not mercury is immediately burnt or blown away. But this like every other scientific chimera, will for ever elude the researches of mankind.

PHILOSOPHIC, or PHILOSOPHICAL, something that relates to philosophy. See PHILOSOPHY.

PHILOSOPHICAL EGG, among chemists, a thin glass-body, or bubble, of the shape of an egg, with a long neck or stem, used in digestions.

PHILOSOPHY, the knowledge or study of nature and morality, founded on reason and experience. See MECHANICS, OPTICS, ASTRONOMY, LOGIC, MORALS, &c.

PHILYCA, in botany, a genus of the pentandria monogynia class. The perianthium is turbinated, and divided into five segments; it has no petals, but five scales fortifying the stamina. There are six species, none of them natives of Britain.

PHIMOSIS, in medicine, a disorder of the penis, in which the prepuce is rendered so strict or tense, that it cannot be drawn back over the glans. See MEDICINE.

PHLEBOTOMY, the opening a vein with a proper sharp-edged and pointed instrument of steel, in order to let out a proper quantity of blood, either for the preservation or recovery of a person's health.

PHLEGM, in the animal œconomy, one of the four humours whereof the ancients supposed the blood to be composed.

The chemists make phlegm, or water, an elementary body, the characters of which are fluidity, insipidity, and volatility.

PHLEGMAGOGUES, in pharmacy, such medicines as purge off phlegm: such are hermodactyls, agaric, turbith, jalap, &c.

PHLEGMATIC, among physicians, an appellation given to that temperament or habit of the body, wherein phlegm is predominant; which gives rise to catarrhs, coughs, &c.

PHLEGMON, denotes an external inflammation and tumour, attended with a burning heat, &c.

PHLEUM in botany, a genus of the triandria digynia class. The calix consists of two linear, truncated valves; there are five species, three of them natives of Britain, *viz* the pratense, or meadow cat's-tail-grass; the paniculatum, or branched cat's-tail-grass; and the nodosum, or bulbose cat's-tail-grass.

PHLOGIDIAUGIA a class of fossils, the characters of which are, that the bodies comprehended in it are transparent and inflammable: such are sulphur, orpiment, zarnick, and amber.

PHLOGISCIERIA, another class of fossils, which are inflammable bodies of a coarser and more impure texture, and not pellucid: such are ambergrease, jet, asphalta, ampelites, and lithanthrax.

PHLOGISTON. See CHEMESTRY, p 68.

PHLOGONIÆ, a class of compound, inflammable, and metallic fossils, found in small masses of determinately angular figures; comprehending the pyricubia, pyroctogonia, and pyripolygonia.

PHLOMIS, in botany, a genus of the didynamia gymnospermia class. The calix is angular; and the superior lip of the corolla is compressed, incumbent, and hairy. There are twelve species, none of them natives of Britain.

PHLOX, in botany, a genus of the pentandria monogynia class. The corolla is shaped like a jug; the filaments are unequal; the stigma is trifid; and the capsule has three cells, and contains but one seed.

PHLYCTÆNÆ, in medicine, small eruptions on the skin.

PHOCA, in zoology, a genus of quadrupeds of the order of the feræ. It has six parallel fore-teeth in the upper jaw, the outermost being larger; and four blunt, parallel, distinct, equal fore-teeth in the under jaw: It has but one dog-tooth, and five or six three-pointed grinders; and the hind-feet are united so as to resemble a fish's tail. There are three species, *viz*. 1. The ursina, or sea-bear, has external ears. This animal swims with incredible swiftness: The males have often 120 females, sons, and daughters, in their train. They copulate on the shore, the female lying on their backs. They are hardly afraid of men, and bite stones when thrown at them. Each has a particular stone for his bed, which they seldom desert. They often fight for their wives and beds; when one is beat off, another makes a fresh attack, and thus succeed alternately, two never attacking one, till the whole be engaged, when they make a hideous wailing noise. They are found in the northern seas. 2. The leonina, or sea-lion, has a crest on his forehead. They are found near the south pole. They swim in troops, and fight for their wives. 3 The vitulina, or sea-calf, has a smooth head, without external ears. They inhabit the European ocean. They generally sleep upon stones above the water, and are easily killed by a stroke above the nose.

PHOCEA, a city of Oeolis, on the west coast of the lesser Asia, anciently so called

PHOENICOPTERUS, or FLAMINGO, in ornithology, a genus of birds belonging to the order of grallæ. The beak is naked, teethed, and bent as if it were broken; the nostrils are linear; and the feet are palmated, and four-toed. There is but one species, a native of Africa and America.

PHOENIX, in astronomy. See ASTRONOMY, p. 487.

PHOENIX, the GREAT PALM, or DATE-TREE, in botany, a genus of plants, the characters of which are not yet perfectly ascertained: the male and female flowers are on distinct plants, or on the same spadix.

PHOLAS, a genus of insects belonging to the order of vermes testacea. The shell is double-valved and divaricated; the cardo is turned backwards, and connected by a cartilage. There are six species, distinguished by the figure of their shells.

PHONICS, the doctrine or science of sounds, otherwise called acoustics. See PNEUMATICS.

PHOSPHORUS. See CHEMISTRY, p. 123.

PHRENES, in anatomy. See ANATOMY, p. 253.

PHRENSY, in medicine, an inflammation of the membranes of the brain, attended with an acute fever and delirium. See MEDICINE, p. 88.

PHRYGIA, the Greater and Leſſer, two provinces anciently of Aſia Minor; having the Helleſpont on the north.

PHTHIRIASIS, in medicine, the pedicularis morbus, or louſy diſeaſe, is moſt incident to children, though adults are not wholly exempt from it.

PHTHISIS, a ſpecies of conſumption, ariſing from an ulcer of the lungs. See MEDICINE, p. 103.

PHYLLANTHUS, in botany, a genus of the monoecia triandria claſs. The calix both of the male and female conſiſts of eight ſegments; neither of them have any corolla; the female has three bifid ſtyli; the capſule has three cells, and contains one ſeed. There are ſix ſpecies, none of them natives of Britain.

PHYLLIS, in botany, a genus of the pentandria digynia claſs. The ſtigmata are rough; and the fruit is ſparce. There are two ſpecies none of them natives of Britain.

PHYSALIS, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated; the ſeeds are connivent; and the berry has two cells, and is contained within an inflated calix. There are ten ſpecies, none of them natives of Britain.

PHYSETER, in zoology, a genus belonging to the order of Cete. It has teeth in the under jaw, and a fiſtula in in the head or ſnout. There are four ſpecies, *viz.* 1. The catodon, with a fiſtula in the ſnout, and having no back-fin. 2. The macrocephalus has a fiſtula in the neck, and no back-fin. The ſpermaceti is extracted from the ventricles of its brain. 3. The microps, with a long fin on the back, and the upper jaw much longer than the under one. 4. The turſio, with a very high fin on the back; and the points of the teeth blunt. All the four ſpecies are inhabitants of the northern Ocean.

PHYSIC. See MEDICINE.

PHYSICAL, ſomething relating to nature.

PHYSICIAN, a perſon who profeſſes medicine, or the art of healing diſeaſes.

PHYSICS, a denomination ſometimes given to natural philoſophy.

PHYSIOLOGY, properly denotes a diſcourſe of nature, and natural bodies; or, it is that part of natural philoſophy which treats of the various phænomena of nature in a ſcientifical and ſpeculative way.

Among phyſicians, the term phyſiology denotes the hiſtory of the human body and its ſeveral conſtituent parts, with their relations and functions.

PHYTEUMA, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated, with linear laciniæ; the ſtigma is trifid; and the capſule has two or three cells. The ſpecies are ſix, only one of them, *viz.* the orbicularis, or horned rampions, a native of Britain.

PHYTOLACCA, in botany, a genus of the decandria decagynia claſs. It has no calix; the petals are five; and the berry has ten cells, and ten ſeeds. There are four ſpecies, none of them natives of Britain.

PHYTOLOGY, a diſcourſe concerning the kinds and virtues of plants.

PIA MATER, in anatomy, See ANATOMY, p. 285.

PICA, in ornithology. See CORVUS.

PICA, in medicine, a depravation of appetite, which makes the patient long for what is unfit for food, or incapable of nouriſhing, as chalk, aſhes, coals, plaſter, lime, &c.

PICÆ, the name of a claſs of birds. See NATURAL HISTORY.

PICARDY, a province of France, bounded by the French Netherlands, and the ſtraights of Dover, on the north and eaſt; by the iſle of France, on the ſouth; and by Normandy, and the Engliſh channel, on the weſt.

PICKLE, a brine or liquor, commonly compoſed of ſalt, vinegar, &c. ſometimes with the addition of ſpices; wherein meat, fruit, and other things are preſerved and ſeaſoned.

PICKERY, in Scots law, petty theft, or ſtealing things of ſmall value.

PICQUERING, a flying war or ſkirmiſh made by ſoldiers detached from two armies for pillage, or before a main battle begins.

PICRIS, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the calix is caliculated; the pappus is feathery; and the ſeeds are furrowed tranſverſely. There are four ſpecies, two of them natives of Britain, *viz.* the echioides, or ox's tongue; and the hieracioides, or yellow ſuccory.

PICTS WALL, in antiquity, a wall begun by the emperor Adrian, on the northern bounds of England, to prevent the incurſions of the Picts and Scots. It was firſt made only of turf, ſtrengthened with palliſadoes, till the emperor Severus coming in perſon into Britain built it with ſolid ſtone. This wall, part of which ſtill remains, begun at the entrance of Solway-frith in Cumberland, and running N. E. extended to the German ocean

PICTURE, a piece of painting, or a ſubject repreſented in colours, on wood, canvas, paper, or the like.

PICUS, the WOOD-PECKER, in ornithology, a genus belonging to the order of picæ. The beak is ſtrait, and conſiſts of many ſides, and like a wedge at the point; the noſtrils are covered with briſtly feathers; the tongue is round like a worm, very long, ſharp at the point, which is beſet with briſtles bent backwards. There are 21 ſpecies, diſtinguiſhed by their colour.

PIECE, in heraldry, denotes an ordinary or charge. See CHARGE.

PIEDMONT, a principality of Italy, ſo called from its lying at the foot of the Alps. It is bounded by Savoy, from which it is ſeparated by the Alps, on the north; by the duchies of Milan and Montferrat, on the eaſt; by the territories of Genoa, and the county of Nice, on the ſouth: and by France, on the weſt; being about 100 miles long, and 70 broad.

PIER, in building, denotes a maſs of ſtone, &c. oppoſed by way of fortreſs againſt the force of the ſea, or a great river, for the ſecurity of ſhips that lie at harbour in any haven.

PIETISTS, a religious ſect ſprung up among the proteſtants of Germany, ſeeming to be a kind of mean between the quakers of England, and the quietiſts of the Romiſh church.

PIG, in zoology. See SUS.

Guinea-PIG. See MUS.

PIG *of lead*, the eighth part of a fother, amounting to two hundred and fifty pounds weight.

PIGEON, in ornithology. See COLUMBA.

PIGMENTS, preparations uſed by painters, dyers, &c. to impart

impart colours to bodies, or to imitate particular colours.

PIGUS, in ichthyology. See CYPRINUS.

PIKE, in ichthyology. See LUCIUS.

PILASTER, in architecture. See ARCHITECTURE, p. 353.

PILCHARD, in ichthyology. See CLUPEA.

PILE, in heraldry, an ordinary in form of a wedge, contracting from the chief, and terminating in a point towards the bottom of the shield. See Plate CXXXIV. fig. 16.

The pile, like other ordinaries, is borne inverted, ingrailed, *&c.* and issues indifferently from any point of the verge of an escutcheon.

PILES, in medicine. See MEDICINE, p. 143.

PILGRIMAGE, a kind of religious discipline, which consists in taking a journey to some holy place, in order to adore the relics of some deceased saint. Pilgrimages began to be made about the middle ages of the church; but they were most in vogue after the end of the eleventh century, when every one was for visiting places of devotion, not excepting kings and princes themselves; and even bishops made no difficulty of being absent from their churches on the same account. The places most visited were Jerusalem, Rome, Compostella, and Tours; but the greatest numbers now resort to Loretto, in order to visit the chamber of the blessed virgin, in which she was born, and brought up her son Jesus, till he was twelve years of age.

PILL, in pharmacy, a form of medicine resembling a little ball, to be swallowed whole, invented in favour of such as cannot take bitter and ill-tasted medicinal draughts, as also to keep in readiness for occasional use without decaying.

PILLAR, in architecture, a kind of irregular column, round and insulated, but deviating from the proportions of a just column. See ARCHITECTURE.

PILLORY, was anciently a post erected in a cross road, by the lord of the manor, with his arms upon it, as a mark of his seignory, and sometimes with a collar to fix criminals to.

PILOT, a person employed to conduct ships over bars and sands, or through intricate channels, into a road or harbour.

PIMENTO, in botany. See MYRTUS, of which it is a species.

The fruits are gathered when green, and are exposed to the sun for many days on cloths, frequently shaking and turning them, till thoroughly dry; they take great care they are not wetted by the morning and evening dews; and when thus dried, are sent over to us.

Pimento abounds with a fragrant essential oil, which is separated, in great quantity, in distillation; and is so heavy that it sinks in water. This spice is much used in our foods, and sometimes in medicine: it is, indeed, a very good aromatic, and so well imitates the mixed flavour of all the rest, that it has long been a common practice to make the aqua mirabilis, which was ordered to be distilled from all the spices, of this ingredient alone; and the taste of the water thus made, when carefully done, is so near the genuine, that a very nice palate can only distinguish it.

PIMPINELLA, in botany, a plant of the pentandria digynia class. The fruit is oblong; and the corolla is subradiated. There are four species, two of them natives of Britain, *viz.* the major, or great burnet saxifrage; and the saxifraga, or small burnet saxifrage.

PIN, in commerce, a little necessary implement made of brass-wire, used chiefly by the women in adjusting their dress.

The perfection of pins consists in the stiffness of the wire and its whiteness, in the heads being well turned, and in the fineness of the points. The London pointing and whitening are in most repute; because our pin-makers, in pointing, use two steel-mills, the first of which forms the point, and the latter takes of all irregularities, and renders it smooth, and as it were polished; and in whitening, they use block-tin granulated; whereas in other countries they are said to use a mixture of tin, lead, and quick-silver.

PINDARIC, in poetry, an ode formed in imitation of the manner of Pindar.

PINE, in botany. See PINUS.

PINE-APPLE. See BROMELIA.

PINEAL GLAND, in anatomy. See ANATOMY, p. 286.

PINGUICULA, in botany, a genus of the diandria monogynia class. The corolla is ringent; the calix is bilabiated; and the capsule has but one cell. There are four species, two of them natives of Britain, *viz.* the vulgaris, or butter-wort; and the lusotanica, or Cornwall butter-wort.

PINION, in mechanics, an arbor, or spindle, in the body whereof are several notches, which catch the teeth of a wheel that serves to turn it round: or it is a lesser wheel which plays in the teeth of a larger.

PINK, a vessel used at sea, masted and rigged like other ships, only that this is built with a round stern; the bends and ribs compassing so as that her ribs bulge out very much.

PINK, in botany. See DIANTHUS.

PINNACE, a small vessel used at sea, with a square stern, having sails and oars, and carrying three masts, chiefly used as a scout for intelligence, and for landing of men, *&c.*

PINNACLE, in architecture, the top or roof of an house, terminating in a point.

PINNATED LEAVES, in botany. See BOTANY, p. 640.

PINUS, in botany, a genus of the monœcia monadelphia class. The calix of the male consists of four leaves; it has no corolla; the stamina are numerous, with naked antheræ. The calix of the female is a strobilus, containing two flowers; it has one pistillum; and the nut is embraced by a membranaceous wing. There are 12 species, three of them natives of Britain, *viz.* the sylvestris, or Scotch fir; the picea, or yellow-leaved fir; and the abies, or common fir.

PIONEER, in the art of war, a labourer employed in an army to smooth the roads, pass the artillery along, and dig lines and trenches, mines, and other works.

PIPE, in law, is a roll in the exchequer, called also the great roll. See the next article.

PIPE-OFFICE, is an office, wherein a person, called the clerk of the pipe, makes out leases of crown-lands, by warrant from the lord-treasurer, or commissioners of the treasury, or chancellor of the exchequer.

PIPER, PEPPER, in botany, a genus of the diandria trigynia class. It has neither calix nor corolla; the berry

contains but one feed. There are 20 fpecies, all natives of warm countries.

PIPER, in ichthyology. See TRIGLA.

PIRACY, in Scots law. See LAW, Tit. xxxiii.

PIRATE, a perfon, or veffel, that robs on the high feas, without permiffion or authority of any prince or ftate.

PISA, a city of Italy, in the duchy of Tufcany, fituated on the river Arno, four miles eaft of the fea, and ten miles north of Leghorn.

PISCARY, in our ancient ftatutes, the liberty of fifhing in another man's waters.

PISCES, in aftronomy, the twelfth fign or conftellation of the zodiac. See ASTRONOMY, p. 487.

PISCINA, in antiquity, a large bafon in a public place or fquare, where the Roman youth learned to fwim, and which was furrounded with a high wall, to prevent cafting of filth into it.

PISSAPHALTUM, EARTH-PITCH, a fluid, opake, mineral body, of a thick confiftence, of a ftrong fmell, readily inflammable, but leaving a refiduum of greyifh afhes after burning. It arifes out of the cracks of rocks, in feveral places in the ifland of Sumatra, and in fome other parts of the Eaft-Indies, and is much efteemed there, in paralytic diforders.

PISSELÆUM INDICUM, BARBADOES TAR, a mineral fluid, of the nature of the thicker bitumens, and of all others the moft approaching in appearance, colour, and confiftence, to the true piffafphaltum, though differing from it in other refpects. It is very frequent in many parts of America, where it is found trickling down the fides of mountains in large quantities, and fometimes floating on the furface of the waters. It has been greatly recommended internally in coughs and other diforders of the breaft and lungs.

PISTACIA, in botany, a genus of the dioecia pentandria clafs. The calix of the amentum in the male confifts of five fegments; it has no corolla: The calix of the female confifts of three fegments; it has no corolla; there are three ftyli; and the drupa contains one feed. There are five fpecies, all natives of warm climates.

Piftachia-nuts abound with a fweet and well-tafted oil, which they will yield in great abundance, on being preffed after bruifing them: they are reckoned wholefome and nutritive, and are very proper to be prefcribed by way of reftoratives, eaten in a moderate quantity, and to people emaciated with long illneffes.

PISTIL, among botanifts. See BOTANY, p. 637.

PISTOL, the fmalleft piece of fire-arms, born at the faddle bow, on the girdle, and in the pocket.

PISTOLE, a gold-coin, ftruck in Spain, and in feveral parts of Italy, Switzerland, &c.

The piftole has its augmentations and diminutions, which are quadruple piftoles, double piftoles, and half piftoles.

PISTON, in pump-work, is a fhort cylinder of metal, or other folid fubftance, fitted exactly to the cavity of the barrel or body of the pump. See HYDROSTATICS.

PISUM, in botany, a genus of the diadelphia decandria clafs. The ftylus is triangular, carinated and downy above; and the two upper laciniæ of the calix are fhorter than the reft. The fpecies are four, only one of them, *viz.* the marinum, or fea-peafe, a native of Britain.

Peas are nutritive, and accordingly ufed for food; but rarely for any medicinal purpofes, except to keep iffues open; for which purpofe they are rubbed with bafilicon, or linimentum Arcæi.

PITCH, a tenaceous oily fubftance, drawn chiefly from pines and firs, and ufed in fhipping, medicine, and various other arts: or it is more properly tar, infpiffated by boiling it over a flow fire.

The method of procuring the tar, is by cleaving the trees into fmall billets, which are laid in a furnace that has two apertures, through one of which the fire is put, and through the other the pitch is gathered, which, oozing from the wood, runs along the bottom of the furnace into places made to receive it. When the fmoke, which is here very thick, gives it blacknefs, this is called tar; which, on being boiled, to confume more of its moifture, becomes pitch.

There is another method of drawing pitch, ufed in the Levant: a pit is dug in the ground, two ells in diameter at the top, but contracting as it grows deeper; this is filled with branches of pine, cloven into fhivers; the wood at the top of the pit is then fet on fire, and burning downwards, the tar runs from it out of a hole made in the bottom; and this is boiled, as above, to give it the confiftence of pitch.

PITH, in vegetation, the foft fpungy fubftance contained in the central parts of plants and trees. See AGRICULTURE, Part I.

PITUITARY GLAND, in anatomy. See ANATOMY, p. 286.

PLACE, in war, a general name for all kinds of fortreffes where a party may defend themfelves.

Common PLACE. See COMMON PLACE.

PLACENTA, in anatomy and midwifery, a foft roundifh mafs found in the womb of pregnant women; which, from its refemblance to the liver, was called by the ancients hepar uterinum, the uterine liver. See MIDWIFERY, p. 208.

PLACENTIA, a city of Spain, in the province of Eftremadura: W. long. 6°, N. lat. 39° 45′.

PLAGIARY, in philology, the purloining another perfon's works, and putting them off for a man's own. Among the Romans, plagiarius was properly a perfon who bought, fold, or retained a freeman for a flave; and was fo called, becaufe by the Flavian law fuch perfons were condemned, ad plagas, to be whipped.

PLAGIURI, among ichthyologifts, a clafs of fifhes comprehending all thofe which have the tails not perpendicular, but placed in an horizontal direction.

PLAGUE, PESTILENCE, or PESTILENTIAL FEVER. See MEDICINE, p. 71.

PLAISE, the Englifh name of a fpecies of the pleuronectes. See PLEURONECTES.

PLAN, in general, denotes the reprefentation of fomething drawn on a plane: fuch are maps, charts, ichnographies, &c.

The term plan, however, is particularly ufed for a draught of a building, fuch as it appears, or is intended to appear, on the ground; fhewing the extent, divifion, and diftribution of its area, or ground-plot, into apartments, rooms, paffages, &c.

PLANE, in geometry, denotes a plain furface, or one that lies evenly between its bounding lines: and as a right line is the fhorteft extenfion from one point to another, fo a plain

plain furface is the fhorteft extenfion from one line to another.

Plane, in joinery, an edged tool, or inftrument for parting and fhaving of wood fmooth.

It confifts of a piece of wood, very fmooth at bottom, as a ftock or fhaft; in the middle of which is an aperture, through which a fteel edge, or chiffel, placed obliquely, paffes; which being very fharp, takes off the inequalities of the wood it is flid along.

PLANE-TREE, in botany. See Platanus.

PLANET, a celeftial body, revolving round the fun as a centre, and continually changing its pofition, with refpect to the fixed ftars; whence the name *planet*, which is a Greek word, fignifying *wanderer*. See Astronomy.

PLANETARIUM, the fame with orrery. See Astronomy, p. 495.

PLANIMETRY, that part of geometry which confiders lines and plain figures, without confidering their height or depth. See Geometry.

PLANISPHERE, fignifies a projection of the fphere, and its various circles on a plane; in which fenfe maps, wherein are exhibited the meridians, and other circles of the fphere, are planifpheres.

PLANT, is defined to be an organical body, deftitute of fenfe and fpontaneous motion, adhering to another body in fuch a manner as to draw from it its nourifhment, and having power of propagating itfelf by feeds. See Agriculture and Botany.

Senfitive Plant. See Mimosa.

PLANTA, in anatomy, the foot. See Anatomy, p. 185.

PLANTAGO, in botany, a genus of the tetrandria monogynia clafs. The calix and corolla has each four fegments; the ftamina are very long; and the capfule is bilocular. There are 21 fpecies, eight of them natives of Britain.

The root, leaves, and feeds of plaintain, are reckoned cooling and aftringent. It is likewife accounted a great healer of frefh wounds.

Water Plaintain. See Ranunculus.

PLANTARIS, in anatomy. See Anatomy, p. 210.

PLANTATION, in the Weft-Indies, denotes a fpot of ground which a planter or perfon arrived in a new colony, pitches on to cultivate for his own ufe, or is affigned for that purpofe. However, the term plantation is often ufed in a fynonymous fenfe with colony.

PLASTER, in pharmacy, is defined to be an external application, of a harder confiftence than our ointments; thefe are to be fpread according to the different circumftances of the wound, place, or patient, either upon linnen or leather.

Plaster, among builders, *&c.* The plafter of Paris is a preparation of feveral fpecies of gypfums, dug near Mont Maitre, a village in the neighbourhood of Paris; whence the name.

The beft fort is hard, white, fhining, and marbly; known by the names of plafter-ftone, or parget of Mount Maitre. It will neither give fire with fteel, nor ferment with aqua fortis; but very freely and readily calcines in the fire, into a very fine plafter; the ufe of which in building, and cafting ftatues, is well known.

PLASTIC, denotes a thing endued with a formative power, or a faculty of forming or fafhioning a mafs of matter, after the likenefs of a living being; fuch a virtue as fome of the ancient Epicureans, and perhaps the Peripatetics too, imagined to refide in the earth, or at leaft to have anciently refided therein, by means whereof, and without any extraordinary intervention of a creator, it put forth plants, *&c.* Some of them feem to be of opinion, that animals, and even man himfelf, was the effect of this plaftic power.

Plastic art, a branch of fculpture, being the art of forming figures of men, birds, beafts, fifhes, *&c.* in plafter, clay, ftuc, or the like.

PLATA, a fmall ifland in the Pacific ocean, near the coaft of Peru, fituated W. long. 81°, S. lat. 1°. It is alfo the name of a city of Peru, capital of the province of La Plata, fituated in W. long. 66° 30′, S. lat. 22° 30′: and alfo the name of a great river of Peru, which rifing in the province of La Plata, and running fouth-eaft till it joins the river Paragua, difcharges itfelf into the Atlantic ocean, below the city of Buenos Ayres.

PLATALEA, or fpoon-bill, in ornithology, a genus belonging to the order of grallæ. The beak is plain, and dilates toward the point into an orbicular form; the feet have three toes, and are half palmated. There are three fpecies, diftinguifhed by their colour.

PLATANUS, the Plane-tree, in botany, a genus of the monœcia polyandria clafs. The calix both of the male and female is a roundifh amentum; the male has no corolla; the corolla of the female confifts of many petals; the ftigma is bent backward; and the feeds are round. The fpecies are two, none of them natives of Britain.

PLATBAND, in gardening, a border or bed of flowers along a wall, or the fide of a parterre frequently edged with box, *&c.*

Platband of a door or window is ufed for the lintel, where that is made fquare or not much arched.

PLATFORM, in the military art, an elevation of earth, on which cannon is placed, to fire on the enemy; fuch are the mounts in the middle of curtains.

Platform, in architecture, is a row of beams, which fupport the timber-work of a roof, and lie on the top of the wall, where the entablature ought to be raifed.

PLATONIC, fomething that relates to Plato, his fchool-philofophy, opinions, or the like.

Platonic year, or the great year, is a period of time determined by the revolution of the equinoxes. See Astronomy, p. 562.

PLATOON, in the military art, a fmall fquare body of forty or fifty men, drawn out of a battalion of foot, and placed between the fquadrons of horfe, to fuftain them.

PLATYSMA myoides, in anatomy. See Anatomy, p. 195.

PLEA, in law, is what either party alledges for himfelf in court, in a caufe there depending; and in a more reftrained fenfe, it is the defendant's anfwer to the plaintiff's declaration.

Court of Common Pleas. See Common-pleas.

PLEASURE and pain, fays Mr Locke, are fimple ideas, which we receive both from fenfation and reflection; there being thoughts of the mind, as well as fenfations, accompanied with pleafure or pain. See Metaphysics.

PLEBEIAN, any perfon of the rank of the common people. It is chiefly ufed in fpeaking of the ancient Romans, who were divided into fenators, knights, and plebeians.

PLEDGE,

PLEDGE, in Scots law. See LAW, Tit. xx. 13.

PLEDGET, BOLSTER, or COMPRESS, in surgery, a kind of flat tent, laid over a wound, to imbibe the superfluous humours, and keep it clean.

PLEIADES, in astronomy, an assemblage of stars in the neck of the constellation taurus. See ASTRONOMY, p. 487.

PLENARY, something complete or full.

PLENIPOTENTIARY, a person vested with full power to do any thing. See EMBASSADOR.

PLENITUDE, the quality of a thing that is full, or that fills another. In medicine, it chiefly denotes a redundancy of blood and humours.

PLENUM, in physics, denotes, according to the Cartesians, that state of things, wherein every part of space is supposed to be full of matter; in opposition to a vacuum.

PLEONASM, a figure in rhetoric, whereby we use words seemingly superfluous, in order to express a thought with the greater energy: such as, I saw it with my own eyes, *&c.*

PLETHORA, in medicine, a greater redundance of laudable blood and humours than is capable of undergoing those changes which must necessarily happen for the purposes of life without inducing diseases.

PLEURA, in anatomy. See ANATOMY, p. 278.

PLEURISY, in medicine. See MEDICINE, p. 89.

PLEURONECTES, in ichthyology, a genus belonging to the order of thoracici. Both eyes are on the same side of the head; there are from four to seven rays in the gill-membrane; the body is compressed, the one side resembling the back and the other the belly. There are 17 species.

PLEXUS, among anatomists, a bundle of small vessels interwoven in the form of net-work.

PLIMOUTH, or PLYMOUTH, a port-town of Devonshire, and a station for the building and laying up of ships of war belonging to the royal navy: W. long. 4° 27′, N. lat. 50° 26′. It sends two members to parliament.

PLIMTON, a borough town of Devonshire, situated near the English Channel, thirty-six miles south-west of Exeter. It sends two members to parliament.

PLINIA, in botany, a genus of the polyandria monogynia class. The corolla consists of five petals, and the calix of five segments; the berry is furrowed, and contains one seed. There is but one species, a native of America.

PLINTH, in architecture, a flat square member, in the form of a brick.

PLOCSKOW, the capital of a palatinate of the same name, in Poland, fifty miles north-west of Warsaw.

PLOT, in dramatic poetry, is sometimes used for the fable of a tragedy or comedy, but more particularly the knot or intrigue, which makes the embarras of any piece.

PLOT, in surveying, the plan or draught of any field, farm, or manor surveyed with an instrument, and laid down in the proper figure and dimensions.

PLOTTING, among surveyors, is the art of laying down on paper, *&c.* the several angles and lines of a tract of ground surveyed by a theodolite, *&c.* and a chain. See GEOMETRY.

PLOVER, in ornithology. See CHARADRIUS.

PLOUGH, in agriculture, a machine for turning up the soil, contrived to save the time, labour, and expence, that without this instrument must have been employed in digging land, to prepare it for the sowing of all kinds of grain. See AGRICULTURE, p. 54.

PLOUGHMAN, the person who guides the plough in in the operation of tilling.

PLOUGHING, in agriculture, turning up the earth with a plough. See AGRICULTURE, p. 57.

PLUKNETIA, in botany, a genus of the monœcia monodelphia class. Neither the male nor the female have any calix; the corolla of each has four petals; the male has four glandular bearded nectaria; the stylus is filiform; the stigma is peltated; and the capsule has four cells, containing one seed. There is but one species, a native of India.

PLUM-TREE, in botany. See PRUNUS.

PLUMAGE, the feathers which serve birds for a covering

PLUMB-LINE, among artificers, denotes a perpendicular to the horizon; so called, as being commonly erected by means of a plummet.

PLUMBAGO, in botany, a genus of the pentandria monogynia class. The corolla is bell-shaped; the stamina are inserted into scales at the base of the corolla; the stigma is quinquefid; and there is but one oblong truncated seed. The species are four, none of them natives of Britain

PLUMBERY, the art of casting and working lead, and using it in buildings, *&c.*

As this metal melts very easily, it is easy to cast it into figures of any kind, by running it into moulds of brass, clay, plaster, *&c.* But the chief article in plumbery is sheets and pipes of lead: and as these make the basis of the plumber's work, we shall here give the process of making them. In casting sheet-lead, a table or mould is made use of, which consists of large pieces of wood well jointed, and bound with bars of iron at the ends, on the sides of which runs a frame consisting of a ledge, or border of wood, two or three inches thick, and two or three inches high from the mould, called the sharps; the ordinary width of the mould, within these sharps, is from three to four feet; and its length is sixteen, seventeen, or eighteen feet. This should be something longer than the sheets are intended to be, in order that the end where the metal runs off from the mould may be cut off, because it is commonly thin or uneven, or ragged at the end. It must stand very even or level in breadth, and something falling from the end in which the metal is poured in, *viz.* about an inch, or an inch and a half, in the length of sixteen or seventeen inches. At the upper end of the mould stands the pan, which is a concave triangular prism, composed of two planks nailed together at right angles, and two triangular pieces fitted in between them at the ends. The length of this pan is the whole breadth of the mould in which the sheets are cast: it stands with its bottom, which is a sharp edge, on a form at the end of the mould, leaning with one side against it; and on the opposite side is a handle to lift it up by, to pour out the melted lead; and on that side of the pan next the mould, are two iron hooks to take hold of the mould, and prevent the pan from slipping, while the melted lead is pouring out of it into the mould. This pan is lined on the inside with moistened sand, to prevent it from being fired by the hot metal. The mould is also spread over, about two thirds of an inch thick, with sand sifted and moistened

ened, which is rendered perfectly level by moving over it a piece of wood called a ſtrike, by trampling upon it with the feet, and ſmoothing it over with a ſmoothing plane, which is a thick plate of poliſhed braſs, about nine inches ſquare, turned up on all the four edges, and with a handle fitted on to the upper or concave ſide. The ſand being thus ſmoothed, it is fit for caſting ſheets of lead: but if they would caſt a ciſtern, they meaſure out the bigneſs of the four ſides; and having taken the dimenſions of the front, or fore-part, make mouldings by preſſing long ſlips of wood, which contain the ſame mouldings, into the level ſand, and form the figures of birds, beaſts, *&c.* by preſſing in the ſame manner leaden figures upon it, and then taking them off, and at the ſame time ſmoothing the ſurface where any of the ſand is raiſed up, by making theſe impreſſions upon it. The reſt of the operation is the ſame in caſting either ciſterns or plain ſheets of lead: but before we proceed to mention the manner in which that is performed, it will be neceſſary to give a more particular deſcription of the ſtrike. The ſtrike then is a piece of board about five inches broad, and ſomething longer than the breadth of the mould on the inſide; and at each end is cut a notch, about two inches deep, ſo that when it is uſed, it rides upon the ſharps with thoſe notches. Before they begin to caſt, the ſtrike is made ready by tacking on two pieces of an old hat on the notches, or by ſlipping a caſe of leather over each end, in order to raiſe the under ſide about one eighth of an inch, or ſomething more, above the ſand, according as they would have the ſheet to be in thickneſs; then they tallow the under edge of the ſtrike, and lay it acroſs the mould. The lead being melted, it is laddled into the pan, in which, when there is a ſufficient quantity for the preſent purpoſe, the ſcum of the metal is ſwept off with a piece of board to the edge of the pan letting it ſettle on the ſand, which is by this means prevented from falling into the mould at the pouring out of the metal. When the lead is cool enough, which is known by its beginning to ſtand with a ſhell or wall on the ſand round the pan, two men take the pan by the handle, or elſe one of them lift it up by a bar and chain fixed to a beam in the ceiling, and pour it into the mould, while another man ſtands ready with the ſtrike, and, as ſoon as they have done pouring in the metal, puts on the mould, ſweeps the lead forward, and draws the overplus into a trough prepared to receive it. The ſheets being thus caſt, nothing remains but to planiſh the edges in order to render them ſmooth and ſtraight: but if it be a ciſtern, it is bent into four ſides, ſo that the two ends may join the back, where they are ſoldered together, after which the bottom is ſoldered up.

The method of caſting thin ſheets of lead. Inſtead of ſand, they cover the mould with a piece of woolen ſtuff nailed down at the two ends to keep it tight, and over this lay a very fine linen cloth. In this proceſs great regard is had to the juſt degree of heat, ſo as that the lead may run well, and yet not burn the linen. This they judge of by a piece of paper; for it takes fire in the liquid lead if it is too hot, and if it be not ſhrunk and ſcorched a little, it is not hot enough. They have here a ſtrike different from that deſcribed above: it is a wooden caſe, only cloſed on three ſides: it is pretty high behind; but the two ſides, like two acute angles, ſtill diminiſh to the tip from the place where they are joined to the third or middle piece, where they are of the ſame height therewith, *viz.* ſeven or eight inches high, the width of the middle makes that of the ſtrike, which again makes that of the ſheet to the caſt. This ſtrike is placed at the top of the mould, which in that part is firſt covered with a paſteboard that ſerves as a bottom to the caſe, and prevents the linen from being burnt while the lead is pouring in. The ſtrike is now filled with lead, according to the quantity to be uſed; which done, two men, one at each ſide, draw the ſtrike down the mould with a velocity greater or leſs, as the ſheet is to be more or leſs thick.

The method of caſting pipes without ſoldering. To make theſe pipes, they have a kind of little mill, with arms or levers to turn it withal. The moulds are of braſs, and conſiſt of two pieces, which open and ſhut by means of hooks and hinges, their inward caliber, or diameter, being according to the ſize of the pipe to be made, and their length is uſually two feet and a half. In the middle is placed a core, or round piece of braſs or iron, ſomewhat longer than the mould, and of the thickneſs of the inward diameter of the pipe. This core is paſſed through two copper-rundles, one at each end of the mould, which they ſerve to cloſe; and to theſe is joined a little copper-tube about two inches long, and of the thickneſs the leaden pipe is intended to be of. By means of theſe tubes the core is retained in the middle of the cavity of the mould. The core being in the mould, with the rundles at its two ends, and the lead melted in the furnace, they take it up in a ladle and pour it into the mould by a little aperture at one end, made in the form of a funnel. When the mould is full they paſs a hook into the end of the core, and turning the mill, draw it out; and then opening the mould, take out the pipe. If they deſire to have the pipe lengthened, they put one end of it in the lower end of the mould, and paſs the end of the core into it; then ſhut the mould again, and apply its rundle and tube as before, the pipe juſt caſt ſerving for rundle, *&c.* at the other end. Things being thus replaced, they pour in freſh metal, and repeat the operation till they have got a pipe of the length required.

For making pipes of ſheet-lead, the plumbers have wooden cylinders of the length and thickneſs required; and on theſe they form their pipes by wrapping the ſheet around them, and ſoldering up the edges all along them.

PLUMBUM, LEAD See CHEMISTRY, p. 84.

PLUME, in botany See AGRICULTURE, p. 41.

PLUMMET, PLUMB RULE, or PLUMB LINE, an inſtrument uſed by carpenters, maſons, *&c.* in order to judge whether walls, *&c.* be upright planes, horizontal, or the like. It is thus called from a piece of lead, faſtened to the end of a cord, which uſually conſtitutes this inſtrument. Sometimes the ſtring deſcends along a wooden ruler, *&c.* raiſed perpendicularly on another; in which caſe it becomes a level.

PLUMMING, among miners, is the method of uſing a mine-dial, in order to know the exact place of the work where to ſink down an air-ſhaft, or to bring an adit to the work, or to know which way the load inclines when any flexure happens in it.

It is performed in this manner: A ſkilful perſon, with an aſſiſtant, and with pen, ink and paper, and a long line, and a ſun-dial, after his gueſs of the place above ground, deſcends into the adit or work, and there faſtens one end of the line to ſome fixed thing in it; then the incited needle

is let to reſt, and the exact point where it reſts is marked with a pen: he then goes on farther in the line ſtill faſtened, and at the next flexure of the adit he makes a mark on the line by a knot or otherwiſe; and then letting down the dial again, he there likewiſe notes down that point at which the needle ſtands in this ſecond poſition. In this manner he proceeds, from turning to turning, marking down the points, and marking the line, till he comes to the intended place: this done, he aſcends, and begins to work on the ſurface of the earth what he did in the adit, bringing the firſt knot in the line to ſuch a place where the mark of the place of the needle will again anſwer its pointing, and continues this till he come to the deſired place above ground, which is certain to be perpendicularly over the part of the mine into which the air-ſhaft is to be ſunk.

PLUMOSE, ſomething formed in the manner of a feather, with a ſtem and fibres iſſuing from it on each ſide; ſuch are the antennæ of certain moths, butterflies, *&c.*

PLURAL, in grammar, an epithet applied to that number of nouns and verbs which is uſed when we ſpeak of more than one thing. See GRAMMAR.

PLURALITY, a diſcrete-quantity, conſiſting of two or a greater number of the ſame kind; thus we ſay a plurality of gods, *&c.*

PLUS, in algebra, a character marked thus +, uſed for the ſign of addition.

PLUSH, in commerce, *&c.* a kind of ſtuff having a ſort of velvet knap, or ſhag, on one ſide, compoſed regularly of a woof of a ſingle woolen thread, and a double warp; the one wool, of two threads twiſted; the other goats or camels hair; though there are ſome pluſhes entirely of worſted, and others compoſed wholly of hair.

PLUVIALIS, in zoology. See CHARADRIUS.

PNEUMATICS.

THIS ſcience treats of the nature, weight, and preſſure of the air, and the effects ariſing from it.

The air is that thin tranſparent fluid body in which we live and breathe. It encompaſſes the whole earth to a conſiderable height; and, together with the clouds and vapours that float in it, is called the atmoſphere. The air is juſtly reckoned among the number of fluids, becauſe it has all the properties by which a fluid is diſtinguiſhed. (See HYDROSTATICS.) For it yields to the leaſt force impreſſed, its parts are eaſily moved among one another, it preſſes according to its perpendicular height, and its preſſure is every way equal.

That the air is a fluid, conſiſting of ſuch particles as have no coheſion betwixt them, but eaſily glide over one another, and yield to the ſlighteſt impreſſion, appears from that eaſe and freedom with which animals breathe in it, and move through it without any difficulty or ſenſible reſiſtance.

But it differs from all other fluids in the three following particulars. It can be compreſſed into a leſs ſpace than what it naturally poſſeſſeth. which no other fluid can. 2. It cannot be congealed or fixed, as other fluids may. 3. It is of a different denſity in every part, upward from the earth's ſurface, decreaſing in its weight, bulk for bulk, the higher it riſes; and therefore muſt alſo decreaſe in denſity. 4 It is of an elaſtic or ſpringy nature, and the force of its ſpring is equal to its weight.

That air is a body, is evident from its excluding all other bodies out of the ſpace it poſſeſſes; for, if a glaſs jar be plunged with its mouth downward into a veſſel of water, there will but very little water get into the jar, becauſe the air of which it is full keeps the water out

As air is a body, it muſt needs have gravity or weight: and that it is weighty, is demonſtrated by experiment. For, let the air be taken out of a veſſel by means of the air pump; then, having weighed the veſſel, let in the air again; and upon weighing it, when re-filled with air, it will be found conſiderably heavier. Thus, a bottle that holds a wine quart, being emptied of air, and weighed, is found to be about 17 grains lighter than when the air is let into it again; which ſhews that a quart of air weighs 17 grains. But a quart of water weighs 14625 grains; this divided by 17, quotes 860 in round numbers; which ſhews, that water is 860 times as heavy as air near the ſurface of the earth.

As the air riſes above the earth's ſurface, it grows rarer, and conſequently lighter, bulk for bulk. For ſince it is of an elaſtic or ſpringy nature, and its lowermoſt parts are preſſed with the weight of all that is above them, it is plain that the air muſt be more denſe or compact at the earth's ſurface, than at any height above it; and gradually rarer the higher up. For, the denſity of the air is always as the force that compreſſeth it: and therefore, the air towards the upper parts of the atmoſphere being leſs preſsed than that which is near the earth, it will expand itſelf, and thereby become thinner than at the ſurface of the earth.

Dr Cotes has demonſtrated, that if altitudes in the air be taken in arithmetical proportion, the rarity of the air will be in geometrical proportion. For inſtance,

At the altitude of … miles above the ſurface of the earth, the air is	… times thinner and lighter than at the earth's ſurface.
7	4
14	16
21	64
28	256
35	1024
42	4096
49	16384
56	65536
63	262144
70	1048576
77	4194304
84	16777216
91	67108864
98	268435456
105	1073741824
112	4294967296
119	17179869184
126	68719476736
133	274877906944
140	1099511627776

And hence it is eaſy to prove by calculation, that a cubic inch of ſuch air as we breathe, would be ſo much rarefied at the altitude of 500 miles, that it would fill a ſphere equal in diameter to the orbit of Saturn.

The

The weight or pressure of the air is exactly determined by the following experiment.

The Toricellian Experiment.

Take a glass tube about three feet long, and open at one end: fill it with quicksilver; and putting your finger upon the open end, turn that end downward, and immerse it into a small vessel of quicksilver, without letting in any air: then take away your finger, and the quicksilver will remain suspended in the tube $29\frac{1}{2}$ inches above its surface in the vessel; sometimes more, and at other times less, as the weight of the air is varied by winds and other causes. That the quicksilver is kept up in the tube by the pressure of the atmosphere upon that in the bason, is evident; for, if the bason and tube be put under a glass, and the air be then taken out of the glass, all the quicksilver in the tube will fall down into the bason; and if the air be let in again, the quicksilver will rise to the same height as before. Therefore the air's pressure on the surface of the earth, is equal to the weight of $29\frac{1}{2}$ inches depth of quicksilver all over the earth's surface, at a mean rate.

A square column of quicksilver, $29\frac{1}{2}$ inches high, and one inch thick, weighs just 15 pounds, which is equal to the pressure of air upon every square inch of the earth's surface; and 144 times as much, or 2160 pounds, upon every square foot; because a square foot contains 144 square inches. At this rate, a middle-sized man, whose surface may be about 14 square feet, sustains a pressure of 30240 pounds, when the air is of a mean gravity: a pressure which would be insupportable, and even fatal to us, were it not equal one very part, and counterbalanced by the spring of the air within us, which is diffused through the whole body, and re-acts with an equal force against the outward pressure

Now since the earth's surface contains (in round numbers) 200 000,000 square miles, and every square mile 27,878,400 square feet, there must be 5,575,680.000,000.000 square feet on the earth's surface; which multiplied by 2160 pounds (the pressure on each square foot) gives 12,043,468.800 000,000,000 pounds for the pressure or weight of the whole atmosphere.

When the end of a pipe is immersed in water, and the air is taken out of the pipe, the water will rise in it to the height of 33 feet above the surface of the water in which it is immersed; but will go no higher: for it is found that a common pump will draw water no higher than 33 feet above the surface of the well: and unless the bucket goes within that distance from the well, the water will never get above it. Now, as it is the pressure of the atmosphere, on the surface of the water in the well, that causes the water to ascend in the pump, and follow the piston or bucket, when the air above it is lifted up it is evident, that a column of water 33 feet high, is equal in weight to a column of quicksilver of the same diameter $29\frac{1}{2}$ inches high; and to as thick a column of air, reaching from the earth's surface to the top of the atmosphere. See Hydrostatics.

Of the BAROMETER.

In serene calm weather, the air has weight enough to support a column of quicksilver 31 inches high; but in tempestuous stormy weather, not above 28 inches. The quicksilver, thus supported in a glass tube, is found to be a nice counterbalance to the weight or pressure of the air, and to shew its alterations at different times. And being now generally used to denote the changes in the weight of the air, and of the weather consequent upon them, it is called the *barometer*, or weather-glass.

The mercury will stand at the same height either in an inclined barometer or in an erect one.

If the mercury at any time stands at the height of 30 inches in the barometer D, (Plate CXLV. fig. 6.) then by inclining this barometer into the position E, the perpendicular height of the mercury will not be altered; for it will still stand at the height of 30 inches: so that if the level AB is 30 inches from the surface FG, the mercury will stand at this level, either in the erect tube D or in the inclined one E. Now here it is evident, that if NL is the height of the mercury when the tube is erect, and NM is the height of the mercury in the same tube or an equal one when it is inclined, there must be more mercury in the inclined tube than there is in the erect one. For we may consider NL as the side, and NM as the diagonal, of a right-angled parallelogram. But the diagonal of a right angled parallelogram is longer than the side. Therefore, though either L or M are at the same perpendicular distance from FG, yet NM will be longer than NL. Since then the column of mercury is longer in the inclined tube than in the erect one, there will be more mercury in the inclined than in the erect one. The question therefore is, How the pressure of the atmosphere can support a greater quantity of matter in one situation of the tube than in the other. We cannot say, that though in the inclined tube there is a greater quantity of mercury than in the erect one, yet a part of this greater weight will be supported by the side of the tube as by an inclined plane. The true answer is, that the column of air which supports the mercury in the inclined tube, is greater than the column which supports it in the erect one. The height of the column of air is indeed the same in both cases; for in either case it is equal to the height of the atmosphere. But the base of the column of air, and consequently its weight, is greater when the tube is inclined than when it is erect. For the base of the column of air which supports the mercury in the tube, is equal to as much of the stagnant mercury's surface as the base of the tube covers. Now, if the diameters of the tubes D and E are equal; the base of the inclined tube E will cover a greater part of the surface FG than the erect tube D covers, or the base of the tube E will be greater than the base of the tube D. For the contents of the inclined tube are greater than those of the erect one, as has been shewn already. But the column of mercury in each of the tubes are cylinders of the same height. Therefore their bases are as their contents. Euc. b. XII. prop. 11. Since then the contents or the weights of mercury in each tube are as their bases, when their heights are equal; and the base of the column of air, which supports the mercury, and consequently the weight of this column, is proportional to the base of the tube; it follows, that the weight of the air will always be proportional to the weight of the mercury when it stands at a given height, whether the tube is inclined or erect.

Though we have here shewn, that the contents of the inclined tube are greater than those of the erect one, and consequently that their bases must be unequal, since their perpendicular heights are the same; yet it will not be improper to shew what we mean by the base of the inclined tube, or rather of the inclined column of mercury, and why this should be greater than the base of the erect one. Now by

the base of the inclined column we do not mean the bottom of the inclined tube, but the lowest horizontal section of it. Thus, if we consider the surface FG as a plane passing through the two tubes D and E, this plane will cut the tube D perpendicularly, and the tube E obliquely. But a perpendicular section of a cylinder is a circle, and an oblique section of it is an ellipsis. Therefore the base of the erect column is circular, and the base of the inclined tube is elliptical. Now, by the supposition, the two tubes have equal diameters, and consequently the shorter axis of the elliptical base will be equal to the diameter of the circular one.

There is another sort of inclined barometer, such an one as ABR, (*ibid.* fig. 7.) which is erect for 28 inches from A to B, and then is inclined from B to C. The mercury will stand at the same height in this barometer, as if it had been a strait one AS: for the column of air pressing at the base A would be the same in either case: and though there is more mercury in the tube ABR than there would be in the tube ABS; yet, supposing the mercury to stand at the same level DC in either case, the pressure of the mercury downwards will in either case be the same. For, the pressure of fluids is as their base and perpendicular height: and here the base A is the same, and the perpendicular height is the same, whether the tube is erect all the way up as AS, or is inclined at the top as ABR.

The advantage which is proposed by these diagonal barometers, as they are called, is to make the variation of the mercury greater, and consequently more apparent, upon a given change in the weather. Thus suppose AB or 28 inches to be the least height of the mercury, and AD or 31 inches to be the greatest height of it: then the whole variation will be within the compass BD, or 3 inches. But if the barometer, instead of being erect at the top, is inclined into the position BC; then, as the mercury stands at the same perpendicular height in this diagonal barometer as in an erect one, AB will be the least height, and ABC will be the greatest height, since D and C are on the same level or at the same perpendicular distance from A. Now though BD, one side of the parallelogram, is but 3 inches long; yet BC may be 30 inches long, or more; and consequently since AB is the least height, and ABC is the greatest height, the variation of the mercury will be much greater than in an erect barometer; in particular, if BC is 30 inches long, the variation will be 30 inches instead of 3, or will be 10 times greater in the diagonal barometer than it would have been in an erect one.

The barometer stands at the same perpendicular height, whether the tube is large or small.

If the mercury stands at the same height either in the large tube C or in the small tube D, there must be more mercury in the large one than in the small one. But since the heights are equal, the quantities of mercury contained in these tubes will be as their bases. Now since the columns of air, by which the mercury is supported in these tubes, are as the respective bases of the tubes, the columns of air will be proportional to the weights in each tube, when the perpendicular heights are equal.

But though the heights of the mercury would be the same in small tubes as in large ones, if, as we must suppose in the proposition, the mercury moved equally free in both; yet in fact, upon any change of weather, the variation will be greater in a large tube than in a small one: because, in a large tube, the weight of mercury is so great, that the motion of it will not be hindered by any attraction or repulsion of the glass upon it; whereas, in a small tube, where the weight of mercury is less, the action of the glass is considerable in proportion to that weight, and consequently the variations will be less upon a given change of the weather.

The barometer will commonly be low in rainy weather.

From what has been said already about the barometer, it appears, that the mercury will be low when the weight of the atmosphere is diminished; and such a diminution of the atmosphere will occasion rain. Therefore, since rain is occasioned by the same cause that makes the mercury fall, the barometer will commonly stand low in rainy weather.

The barometer is the lowest of all in violent storms of wind.

When the air moves horizontally with a great velocity, as it does in violent storms of wind, its weight, or rather its pressure downwards occasioned by its weight, will be diminished. For as any heavy body may have such a velocity given it, when it is thrown down horizontally, as may either carry it quite off from the earth's centre, or such a velocity as will make it move round the earth in a circle without either departing from the centre or approaching to it; so every degree of velocity given to the air will make it tend or press less towards the centre; and for this reason, as the mercury in the bason will be less pressed, the height of it in the tube will be less in storms than it is any other time.

When a storm of wind is over, the mercury will rise very fast.

Because as the horizontal velocity of the air ceases the pressure downwards will be suddenly restored, and consequently the mercury in the barometer will keep rising as this pressure is restored.

Of the THERMOMETER.

The variations of different thermometers are seldom equal, upon equal variations of heat or cold.

A THERMOMETER is a well-known instrument for estimating different degrees of heat or cold. It consists of a tube or stem, with a hollow ball at one end of it. The cavity of the ball, and part of the tube, is filled with spirits of wine, or with linseed oil, or with mercury. The upper end of the tube is commonly sealed hermetically. But in sealing this end, the liquor in the thermometer is rarefied by heating it till it almost fills the tube; so that when it is sealed, and the liquor contracts again as it cools, there will be a vacuum left in the upper part of the tube. Any of these fluids will rarefy by heat, and will contract again when they cool: and consequently in warm weather, the spirits, or the oil, or the mercury, whichever the thermometer is made of, will stand higher than in cold weather.

Thus far thermometers may be said to vary alike: they will either rise or sink from the same causes. But then, upon an equal increase of heat, they seldom vary equally, though they are made of the same liquor. One thermometer made with spirits of wine may vary upon an equal increase of heat much more than another that is made with the same sort of spirits: so that if one rises an inch, another may rise but $\frac{1}{2}$ or $\frac{1}{4}$ inch.

The variation of a thermometer is directly as the capacity of

of the ball, and inversely as the base of the stem. First, If the base of the stem or cylindrical tube is given, the variation, when the spirits are equally warmed, will be directly as the capacity of the ball. For when the spirits are equally warmed, and consequently are equally rarefied in the balls of two different thermometers, whatever proportion the bulk of the spirits in one ball bears to the bulk of the spirits in the other ball before they were rarefied, the same proportion these bulks will still bear to each other after they are rarefied. Thus, if one ball is double the other, and consequently the bulk of spirits in one is double the bulk of spirits in the other before they are warmed; then, upon being warmed equally, their densities will diminish equally. But if their densities diminish equally, their bulks will still have the same proportion to each other; or the bulk of spirits in one thermometer will still be double the bulk in the other. But if the bulks continue in the same proportion to each other, after they are swelled as they were before; the spirits must swell in proportion to their respective bulks, or the spirits in one must swell twice as much as in the other. But if the spirits swell in this proportion, and by swelling rise into equal tubes in each, they must rise twice as high in the tube of one of these thermometers as they do in the tube of the other. And so, in all other instances, the spirits, upon being equally warmed, will swell in proportion to their bulk, that is, in proportion to the capacity of the ball that contains them. But the heights, to which they rise in equal tubes, will be as the increase of their bulk. Therefore the heights to which they rise, or the variations in equal degrees of heat, will be as the capacity of the ball, when the tubes are equal. We have here supposed that the spirits in the balls of the thermometers are equally heated quite through. In sudden changes of heat and cold, it will be otherwise: for the spirits in a small ball will be sooner heated quite through than in a large one. And consequently, if the heat does not last long enough to warm the spirits in a large ball as much as they are warmed in a small one, the spirits will not be equally rarefied in both, and will not swell in proportion to their respective bulks; but those in the small ball will swell more in proportion than those in the large one. Secondly, If the balls are equal, the variations will be inversely as the bases of the stems. For if the balls are equal, then, upon being equally heated, the spirits contained in them will swell equally; and consequently equal quantities will rise into the stems. Now the spirits which rise into a cylindrical stem are a cylindrical column. But the heights of equal cylinders are inversely as their bases. Therefore, when the balls are equal, and equal cylinders of spirits rise into the stems, the heights to which they rise, or the variations, will be inversely as the bases of the stems.

An universal scale may be made, by which the variations of different thermometers may be compared with one another.

Let the ball of a thermometer be put into water when it is beginning to freeze, or, which is the same as to heat or cold, into snow when it is beginning to melt; and let the place where the fluid in the thermometer stands be marked. The place where the fluid stands in such a trial is the freezing point. Let the ball of the same thermometer be put into water just hot enough to let wax, that swims upon it, begin to coagulate. This again is another determinate degree of heat, and is to be marked upon the thermometer. Divide the distance between these two points into 110 equal parts; and each of these parts we call a degree. Now a thermometer often sinks lower than the freezing point; because the cold is frequently more intense than what is just sufficient to make water freeze: for this reason, the scale must not begin from the freezing point. This point, therefore, should not be marked 0, nor should the point where melted wax begins to coagulate be marked 110. In this scale, which from the inventor is called Farenheit's scale, the freezing point is marked 32; and then the point, where melted wax begins to coagulate, being 110 degrees above it, must be marked 142. When the length of a degree is thus found in one part of the scale, 32 degrees of the same length are set off below the freezing point, and as many such degrees as we please are set off above the point where melted wax begins to coagulate. If the thermometer is made with spirits of wine, only 33 degrees need be set off or marked above 142: and then the scale will begin from 0; 32 degrees will be the freezing point; 142 will be the point where melted wax begins to coagulate; and $142+33=175$ degrees will be the highest point marked in the scale. The reason why no higher degree need be marked in a scale applied to a thermometer made with spirits, is, that at this degree of heat the spirits will boil, and consequently the thermometer would burst. But if the thermometer is made with mercury, the scale should contain at least 212 degrees from the bottom to the top, or 32 degrees below the freezing point, and 180 above it. The heat of boiling water, at the middle height of the mercury in the barometer, or in the middle weight of the atmosphere, will raise the mercury in the thermometer to 212 degrees, or 180 degrees above the freezing point. A thermometer made with mercury will not burst in such a degree of heat as this; for mercury requires a greater degree to make it boil.

In thermometers with such a scale, or, as they are called, in Farenheit's thermometers, the greatest degree of heat in the external parts of the human body is commonly about 96. Boerhave imagined that air, if its heat exceeded 80 or 90 degrees at most, would be destructive to the life of animals. But in this he was mistaken. For in the year 1732 the thermometer in Pensylvania was at the height of 96 or 97; and in the year 1734 the height of it at Petersburgh was 98 degrees. The thermometer in our own climate is scarce ever higher than 78 degrees, and seldom lower than 18; so that we may reckon 48 degrees to be the middle temperature of our air.

The variations of different thermometers, though they are not equal, may be compared with one another by Farenheit's scale. For each degree upon different thermometers is proportional to their respective variations; and consequently, though in equal heats one may vary more than another, yet each will vary an equal number of degrees. Thus, if, upon any given increase of heat, one thermometer will vary twice as much as another, then the distance between the freezing point and the point where melted wax begins to coagulate will be twice as great, or 110 degrees will be twice as long, in one as in the other. Therefore each degree will be twice as long in the former thermometer as in the latter. But by the supposition, one of these thermometers in a given degree of heat will vary twice as much as the other does; and consequently, whatever heat raises the former one degree, will likewise raise the latter one degree.

If

If the ball of a thermometer is dipped into hot water, the fluid in the thermometer will ſink a little before it begins to riſe.

Not only fluids, ſuch as ſpirits, oil, or mercury, but likewiſe glaſs, or iron, or almoſt any hard bodies, will expand when they are heated, and will contract again when they grow cold. Now, when the ball of a thermometer is dipped into hot water, the heat will be communicated to the glaſs of which the ball is made, before it is communicated to the fluid contained in the ball. By this means the ball will be expanded, and the capacity of it will be increaſed, ſo that ſome of the fluid will ſink out of the ſtem into it. But when the ball has been long enough in the water for the fluid within it to be heated, this fluid will be expanded: and then it will riſe into the ſtem, and will continue to riſe as the heat increaſes.

OF SOUND.

Sound, in the body that produces it, is a trembling motion: this motion is communicated to the air, and the air conveys it to the ear.

WHEN any elaſtic body is ſtruck, ſo as to produce a ſound, the body, or ſome part of it, is made to vibrate This is evident to ſenſe in the ſtrings of a violin or harpſichord; for either the eye may ſee, or the hand may feel, the trembling of the ſtrings, when by ſtriking them they are made to ſound. See MUSICK.

If a bell is ſtruck by its clapper on the inſide, the bell is made to vibrate. The baſe of the bell is a circle: but by ſtriking any part of this circle on the inſide, the part which is ſtruck will fly out a little way, ſo that the diameter, which paſſes through this part of the circular baſe, will become longer than another diameter which croſſes this at right angles. Therefore by the ſtroke the baſe will be changed into an ellipſis, whoſe longer axis will paſs through the part againſt which the clapper ſtruck. But the elaſticity of the bell will reſtore the figure of the baſe, and will make the part which was forced out of its place return back. This part in returning will acquire velocity in the ſame manner as an elaſtic ſtring would in the ſame circumſtances. And ſince it acquires velocity in returning to its place, it will not ſtop at that place, but will over-run it. Thus the circular figure of the baſe will be changed into an ellipſis again; only now the ſhorter axis will paſs through the part that was firſt ſtruck. If the bell was to be ſtruck at firſt by a hammer on the outſide, the part ſtruck would move inwards; and ſuch a motion would likewiſe change the baſe into an ellipſis: only in this caſe the ſhorter axis of the ellipſis would paſs through that part where the blow was given. The elaſticity of the bell will reſtore its figure; and as the part which was ſtruck will acquire velocity in returning to its proper ſituation, the acquired velocity will not ſuffer it to reſt there, but will carry it farther out from the oppoſite ſide: and the baſe will by this means be again changed into an ellipſis, having the longer axis at that part where the blow was firſt given. Thus we have ſeen, that where-ever the bell is ſtruck the parts of it will perform one vibration; the part, which is ſtruck will yield to the blow; the elaſticity of the bell will bring it back to its former ſituation; in returning, it will acquire velocity; and as far as the blow had driven it one way, ſo far the acquired velocity will carry it the other. But ſince, after one vibration is thus performed, the figure of the baſe will be elliptical; the parts of the bell will vibrate a ſecond time; and ſo on, in the ſame manner that an elaſtic ſtring vibrates.

The ſame ſtroke which makes a bell vibrate makes it ſound too; and as the vibrations decay, the ſound grows weaker. Our ſenſes may convince us that the parts of a bell are in a trembling or vibratory motion whilſt the bell ſounds: for if we lay our hand upon it, we may feel it jar; or if ſmall ſtraws or pieces of paper are thrown upon it, we may ſee that the jarring or trembling of the bell will put them in motion.

But the air muſt convey this vibratory motion to the ear: for otherwiſe, though the ſounding body is made to vibrate, no ſound will be heard. Thus if a bell is rung in the receiver of an air-pump, the ſound will grow weaker as the air is exhauſted; and when all the air is drawn out of the receiver, no ſound at all will be heard. When the air is admitted again into the receiver, the ſound will at the firſt entrance of the air begin to be heard, and will grow louder as more air returns. If the bell was to be rung in like manner in a veſſel where the air is condenſed, the ſound of it would be much louder than it is in common air. And accordingly, when divers are let down to any great depth of water, becauſe the air in the diving-bell is much condenſed, they ſeem to one another to ſpeak much louder than uſual.

The intenſity of ſound, at different diſtances from the ſounding body, is inverſely as the ſquares of the diſtances.

Sounds may differ from one another, both in reſpect of their tone, and in reſpect of their intenſity or ſtrength. In reſpect of their tone, they are diſtinguiſhed into grave and acute; in reſpect of their intenſity, they are diſtinguiſhed into loud or ſtrong, and low or weak. The tone of any ſound depends upon the time that an impreſſion continues, and is not altered by the diſtance of the ear from the ſounding body. But the intenſity or ſtrength of any ſound depends upon the force with which the particles of air, as they are condenſed, ſtrike the ear; and this force is found to be different at different diſtances, ſo that a ſound which is very loud if we are near the body that produces it, would be weaker if we were farther from it, and our diſtance from it may be ſo great that we cannot hear it at all.

The proportion in which the intenſity of ſound decreaſes, as the diſtance of the ear from the ſounding body increaſes, is this: If the different diſtances at which the ear is placed are to one another as 1, 2, 3, 4, 5; then the ſquares of thoſe diſtances are 1, 4, 9, 16, 25; and the intenſity of ſound will be inverſely as theſe ſquares, or as the reciprocals of theſe ſquares; that is, the ſtrength of the ſound will decreaſe in the ſame proportion with the fractions, $\frac{1}{1}\,\frac{1}{4}\,\frac{1}{9}\,\frac{1}{16}\,\frac{1}{25}$, which are the reciprocals of 1, 4, 9, 16, 25. This is what we mean when we ſay that the intenſity of ſound is inverſely as the ſquares of the diſtances, or that it decreaſes in the departure of the ear from the ſounding body in the ſame proportion that the ſquares of the diſtances increaſe.

The intenſity of ſound decreaſes as the vibrations in the ſounding body grow weaker.

If an elaſtic ſtring was to ſtop all at once, the ſound produced by it would ceaſe immediately. But if the vibrations of

of the ſtring decay gradually, the ſound will likewiſe keep growing weaker, till it becomes too weak to be heard. The ſtring performs all its vibrations from the firſt to the laſt in equal times, and conſequently each pulſe that the ſtring produces is produced in an equal time, and upon that account each pulſe from the firſt to the laſt will have the ſame thickneſs. But when the thickneſs of the pulſe is given, the quantity of air, or number of particles, by which the ear is ſtruck, will likewiſe be given; and the moment with which it is ſtruck, or the intenſity of the ſound, will be as the velocity with which the particles move. Now the velocity of the ſtring is ſucceſſively communicated to the particles of air, as they are made to vibrate. Therefore, as the velocity of the ſtring decays, the velocity of the particles, and conſequently the intenſity of the ſound, will likewiſe decay.

The intenſity of ſound is increaſed by a ſpeaking-trumpet.

When a man ſpeaks without ſuch a trumpet, the pulſes, as they are produced, dilate themſelves in all directions, or the motion is immediately communicated to the air all round him. But if he ſpeaks in a trumpet, his voice, that is, the motion produced by his voice, is confined to the ſmall portion of air contained in the trumpet. For this reaſon, as there are fewer particles to be moved than there are when the motion dilates itſelf immediately in all directions, the motion that is communicated will be greater, and conſequently, when the voice comes out of the trumpet, its intenſity or ſtrength will be greater, than it would have been if it had been propagated in all directions at firſt.

Sound moves with the ſame velocity at all diſtances from the ſounding body.

The ſound of a cannon, or of a bell, moves at the rate of 1142 feet in a ſecond at all diſtances from the gun or the bell. If it moves at this rate for the firſt mile, it would move juſt at the ſame rate for the ſecond mile: ſo that a perſon who is within one mile of the cannon when it is diſcharged, will hear the repor juſt as ſoon again as another who is at the diſtance of two miles. The velocity of the ſound does not decreaſe as it is propagated forwards, but continues the ſame from the firſt to the laſt. This property of ſound has been proved by repeated experiments.

When ſound ſtrikes againſt an obſtacle, is will be reflected.

By ſound we here mean the pulſes in the air, which are, properly ſpeaking, the cauſes of ſound. If theſe pulſes in their progreſs ſtrike upon any obſtacle, ſuch as a rock, a thick wood, or the ſide of a building, the air, which is condenſed at the obſtacle, is prevented from expanding itſelf forwards, or from propagating the ſound beyond the obſtacle. Therefore, in expanding itſelf, the motion, which would otherwiſe have been propagated forwards, will be returned from the obſtacle; and a perſon, who is placed ſo as to receive the pulſes in their return, will hear the ſound by reflection. Such a reflected ſound is called an echo.

The number of ſyllables which an echo repeats diſtinctly depends upon the diſtance of the obſtacle from whence the ſound is reflected. The ſyllables that we hear diſtinctly repeated are thoſe which are returned after we have done ſpeaking. Therefore, if the obſtacle is ſo near to us, that the firſt ſyllable we ſpeak will be returned before we can ſpeak a ſecond, no reflected ſound at all can be heard diſtinctly; becauſe the direct and reflected ſound, or the voice and the echo, will be confounded with one another. If the obſtacle is at ſuch a diſtance, that five ſyllables may be ſpoken before one will be returned; then if we ſpeak a ſentence conſiſting of ten ſyllables, the firſt five will be reflected whilſt we are ſpeaking the five laſt, ſo that in ſpeaking the five laſt ſyllables the voice will be confounded with the echo of the five firſt, and we ſhall hear the echo of only the five laſt ſyllables diſtinctly, becauſe theſe only will be returned after we have done ſpeaking. But if the obſtacle is at ſuch a diſtance, that we may ſpeak ten ſyllables before the firſt of them will return to the ſpeaker; then if we ſpeak a ſentence of only ten ſyllables, we ſhall have done ſpeaking before the echo begins, and conſequently we may hear the whole ſentence diſtinctly repeated by the echo.

Sometimes the ſame ſound is frequently repeated by an echo. This happens when there are ſeveral obſtacles at different diſtances. For though there are ſeveral obſtacles, yet if all of them are at the ſame diſtance, the ſound will be returned from them all at one and the ſame time; and conſequently the ſeveral reflected ſounds will be heard togegether, and will make but one echo. But if the obſtacles are at different diſtances, each will return the ſound at a different time, and as many echoes will be heard as there are obſtacles that produce them.

The Diving Bell.

The air in a diving-bell is compreſſed by the weight of the atmoſphere before the bell is let down into the water. But when it has ſunk 35 feet below the ſurface, the air contained in it is compreſſed by the weight of the atmoſphere as before, and by the weight of 35 feet of water beſides, which is equivalent to another atmoſphere. Therefore the compreſſing force at this depth is doubled, and conſequently the air in the bell will then be twice as denſe as the common air that we breathe. As much air, likewiſe, as juſt fills the bell, when it is at the ſurface of the water, will, at the depth of 35 feet, only fill half of it; for as the compreſſing force is doubled, the ſame quantity of air will be reduced to half its uſual dimenſions. For this reaſon, the water would riſe into the bell, through the baſe or bottom of it, which is always open, and would fill the other half of it, if there was not a contrivance for bringing down additional air enough to force out this water, and to keep the whole capacity of the bell full of air. However, the air which fills it will, at the depth of 35 feet, have twice the denſity that common air has; and at the depth of 70 feet, where it will be compreſſed by the weight of another atmoſphere, it will have triple the denſity of common air.

We ſhall here give a ſhort account of the contrivance for bringing down additional air to the diving-bell: becauſe it will ſerve to ſhew, that if a veſſel full of air is ſunk into water, and the water communicates with the air in the veſſel, then the preſſure upon that air will be ſo much the greater as the veſſel is ſunk farther below the ſurface of the water. The contrivance is this. A barrel is made uſe of, which has one bung-hole in the lower part of it, and another in the upper part. A leathern pipe is faſtened to the hole in the upper part; and this pipe is ſo long, that, when it hangs down on the outſide of the barrel, its orifice reaches below the bung hole in the lower part. If this barrel, by the help of weights faſtened to it, is made to ſink with its bottom downwards, the water, by preſſing againſt the lower bung-

bung hole, will condenſe the air contained in the barrel: for, notwithſtanding this preſſure, none of the air can eſcape through the upper hole, becauſe it is kept in by a greater preſſure againſt the orifice of the leathern pipe which hangs below the bottom of the barrel, and conſequently, being deeper in the water, ſuſtains a greater preſſure than what acts againſt the lower bung-hole. If the barrel is let down in this manner, till it gets below the bell, and then the end of the leathern pipe is lifted up into the bell; the lower bung-hole will then be more preſſed than the orifice of the pipe; and therefore the air contained in the barrel will be driven up through the pipe, and will be received into the bell. And becauſe the barrel is deeper in the water than the bell is, the water will preſs more againſt the baſe of the barrel to force the air out of it than it does againſt the baſe of the bell: for which reaſon the air will ruſh out of the barrel with force enough to drive out any water which had riſen into the bell whilſt it was deſcending.

By the ſame contrivance, freſh air is brought down to the bell as often as there is occaſion for it. The air, which has been heated by frequently breathing it, is let out through a ſtop cock in the top of the bell and riſes in bubbles to the ſurface of the water, whilſt freſh air is received from the leathern pipe of a barrel contrived in the manner already deſcribed.

Air *neceſſary for the* Life *of* Animals.

All common air is impregnated with a certain kind of *vivifying ſpirit* or quality, which is neceſſary to continue the lives of animals: and this, in a gallon of air, is ſufficient for one man during the ſpace of a minute, and not much longer.

This ſpirit in air is deſtroyed by paſſing through the lungs of animals; and hence it is, that an animal dies ſoon, after being put under a veſſel which admits no freſh air to come to it. This ſpirit is alſo in the air which is in water; for fiſh die when they are excluded from freſh air, as in a pond that is cloſely frozen over. And the little eggs of inſects ſtopped up in a glaſs, do not produce their young, though aſſiſted by a kindly warmth. The ſeeds alſo of plants mixed with good earth, and incloſed in a glaſs, will not grow.

This enlivening quality in air is alſo deſtroyed by the air's paſſing through fire; particularly charcoal fire, or the flame of ſulphur. Hence ſmoking chimneys muſt be very unwholeſome, eſpecially if the rooms they are in be ſmall and cloſe. See Smoke.

Air is alſo vitiated, by remaining cloſely pent up in any place for a conſiderable time; or perhaps, by being mixed with malignant ſteams and particles flowing from the neighbouring bodies; or laſtly, by the corruption of the vivifying ſpirit; as in the holds of ſhips, in oil-ciſterns, or wine-cellars, which have been ſhut up for a conſiderable time. The air in any of them is ſometimes ſo much vitiated, as to be immediate death to any animal that comes into it.

Air that has loſt its vivifying ſpirit is called *damp*, not only becauſe it is filled with humid or moiſt vapours, but becauſe it deadens fire, extinguiſhes flame, and deſtroys life. The dreadful effects of damps are ſufficiently known to ſuch as work in mines.

The atmoſphere is the common receptacle of all the effluvia or vapours ariſing from different bodies; of the ſteams and ſmoke of things burnt or melted; the fogs or vapours proceeding from damp watery places; and of effluvia from ſulphureous, nitrous, acid, and alkaline bodies. In ſhort, whatever may be called volatile, riſes in the air to greater or leſs heights, according to its ſpecific gravity.

When the effluvia which ariſe from acid and alkaline bodies meet each other in the air, there will be a ſtrong conflict or *fermentation* between them; which will ſometimes be ſo great, as to produce a fire; then if the effluvia be combuſtible, the fire will run from one part to another, juſt as the inflammable matter happens to lie.

Any one may be convinced of this, by mixing an acid and an alkaline fluid together, as the ſpirit of nitre and oil of cloves; upon the doing of which, a ſudden ferment, with a fine flame, will ariſe; and if the ingredients be very pure and ſtrong, there will be a ſudden exploſion.

Whoever conſiders the effects of fermentation, cannot be at a loſs to account for the dreadful effects of *thunder* and *lightening*; (ſee Electricity:) For the effluvia of ſulphureous and nitrous bodies, and others that may riſe into the atmoſphere, will ferment with each other, and take fire very often of themſelves; ſometimes by the aſſiſtance of the ſun's heat.

If the inflammable matter be thin and light, it will riſe to the upper part of the atmoſphere, where it will flaſh without doing any harm; but if it be denſe, it will lie nearer the ſurface of the earth, where taking fire, it will explode with a ſurpriſing force; and by its heat rarefy and drive away the air, kill men and cattle, ſplit trees, walls, rocks, *&c.* and be accompanied with terrible claps of thunder.

The heat of lightening appears to be quite different from that of other fires; for it has been known to run through wood, leather, cloth, *&c.* without hurting them, while it has broken and melted iron, ſteel, ſilver, gold, and other hard bodies. Thus it has melted or burnt aſunder a ſword, without hurting the ſcabbard; and money in a man's pocket, without hurting his cloaths: the reaſon of this ſeems to be, that the particles of the fire are ſo fine, as to paſs through ſoft looſe bodies without diſſolving them; whilſt they ſpend their whole force upon the hard ones.

It is remarkable, that knives and forks which have been ſtruck with lightening have a very ſtrong magnetical virtue for ſeveral years after.

Much of the ſame kind with lightening, are thoſe exploſions, called *fulminating* or *fire-damps*, which ſometimes happen in mines; and are occaſioned by ſulphureous and nitrous, or rather oleaginous particles, riſing from the mine, and mixing with the air, where they will take fire by the lights which the workmen are obliged to make uſe of. The fire being kindled will run from one part of the mine to another, like a train of gunpowder, as the combuſtible matter happens to lie. And as the elaſticity of the air is increaſed by heat, that in the mine will conſequently ſwell very much, and ſo, for want of room, will explode with a greater or leſs degree of force, according to the denſity of the combuſtible vapours. It is ſometimes ſo ſtrong as to blow up the mine; and at other times ſo weak, that when it has taken fire at the flame of a candle, it is eaſily blown out.

Air that will take fire at the flame of a candle may be produced thus. Having exhauſted a receiver of the air-pump; let the air run into it through the flame of the oil of turpentine: then remove the cover of the receiver: and holding a candle to that air, it will take fire, and burn quicker or ſlower, according to the denſity of the oleaginous vapour.

When ſuch combuſtible matter, as is above-mentioned, kindles

kindles in the bowels of the earth, where there is little or no vent, it produces *earthquakes*, and violent ſtorms or hurricanes of wind when it breaks forth into the air

An artificial earthquake may be made thus. Take 10 or 15 ponnds of ſulphur, and as much of the filings of iron, and knead them with common water into the conſiſtence of a paſte: this being buried in the ground, will, in 8 or 10 hours time, burſt out in flames, and cauſe the earth to tremble all around to a conſiderable diſtance.

From this experiment we have a very natural account of the fire of mount Ætna, Veſuvius, and other volcano's, they being probably ſet on fire at firſt by the mixture of ſuch metalline and ſulphureous particles.

Of the AIR-PUMP.

THE *air-pump* being in effect the ſame as the water-pump, (ſee HYDROSTATICS,) whoever underſtands the one will be at no loſs to underſtand the other.

Having put a wet leather on the plate *LL* of the air-pump, (Plate CXLV. fig. 8.) place the glaſs receiver *M* upon the leather, ſo that the hole *i* in the plate may be within the glaſs. Then, turning the handle *F* backward and forward, the air will be pumped out of the receiver; which will then be held down to the plate by the preſſure of the external air or atmoſphere. For, as the handle (fig. 9.) is turned backwards, it raiſes the piſton *de* in the barrel *BK*, by means of the wheel *F* and rack *Dd;* and as the piſton is leathered ſo tight, as to fit the barrel exactly, no air can get between the piſton and barrel; and therefore, all the air above *d* in the barrel is lifted up towords *B*, and a vacuum is made in the barrel from *e* to *b;* upon which, part of the air in the receiver *M* (fig. 8.) by its ſpring, ruſhes through the hole *i*, in the braſs plate *LL*, along the pipe *GGG* (which communicates with both barrels by the hollow trunk *IHK* (fig. 9) and, puſhing up the valve *b*, enters into the vacant place *be* of the barrel *BK*. For, where-ever the reſiſtance or preſſure is taken off, the air will run to that place, if it can find a paſſage.—Then, as the handle *F* will be turned forward, the piſton *de* will be depreſſed in the barrel: and, as the air which had got into the barrel cannot be puſhed back through the valve *b*, it will aſcend through a hole in the piſton, and eſcape through a valve at *d;* and be hindered by that valve from returning into the barrel, when the piſton is again raiſed. At the next raiſing of the piſton, a vacuum is again made in the ſame manner as before, between *b* and *e*; upon which more of the air, which was left in the receiver *M*, gets out thence by its ſpring, and runs into the barrel *BK*, through the valve *B*. The ſame thing is to be underſtood with regard to the other barrel *Al*, and as the handle *F* is turned backwards and forwards, it alternately raiſes and depreſſes the piſtons in their barrels, always raiſing one whilſt it depreſſes the other. And, as there is a vacuum made in each barrel when its piſton is raiſed, every particle of air in the receiver *M* puſhes out another, by its ſpring or elaſticity, through the hole *i* and pipe *GG*, into the barrels, until at laſt the air in the receiver comes to be ſo much dilated, and its ſpring ſo far weakened, that it can no longer get through the valves: and then no more can be taken out. Hence there is no ſuch thing as making a perfect vacuum in the receiver: for the quantity of air taken out at any one ſtroke, will always be as the denſity thereof in the receiver: and therefore it is impoſſible to take it all out, becauſe, ſuppoſing the receiver and barrels of equal capacity, there will be always as much left as was taken out at the laſt turn of the handle.

There is a cock *k* below the pump-plate, which being turned lets the air into the receiver again; and then the receiver becomes looſe, and may be taken off the plate. The barrels are fixed to the frame *Eee* by two ſcrew-nuts *ff*, which preſs down the top piece *E* upon the barrels; and the hollow trunk *H* (in fig. 9.) is covered by a box, as *GH* in fig 8.

There is a glaſs tube *lmmmn* open at both ends, and about 34 inches long; the upper end communicating with the hole in the pump-plate, and the lower end immerſed in quickſilver at *n* in the veſſel *N*. To this tube is fitted a wooden ruler *mm*, called the *gage*, which is divided into inches and parts of an inch, from the bottom at *n* (where it is even with the ſurface of the quickſilver) and continued up to the top, a little below *l*, to 30 or 31 inches.

As the air is pumped out of the receiver *M*, it is likewiſe pumped out of the glaſs tube *lmn*, becauſe that tube opens into the receiver through the pump-plate; and as the tube is gradually emptied of air, the quickſilver in the veſſel *N* is forced up into the tube by the preſſure of the atmoſphere: And if the receiver could be perfectly exhauſted of air, the quickſilver would ſtand as high in the tube as it does at that time in the barometer: for it is ſupported by the ſame power or weight of the atmoſphere in both.

The quantity of air exhauſted out of the receiver on each turn of the handle, is always proportionable to the aſcent of the quickſilver on that turn; and the quantity of air remaining in the receiver, is proportionable to the defect of the height of the quickſilver in the gage, from what it is at that time in the barometer.

EXPERIMENTS WITH THE AIR-PUMP.

I. *To ſhew the reſiſtance of the air.*

1. THERE is a little machine, conſiſting of two mills, *a* and *b*, (*ibid.* fig. 10.) which are of equal weights, independent of each other, and turn equally free on their axes in the frame. Each mill has four thin arms or ſails fixed into the axis; thoſe of the mill *a* have their planes at right angles to its axis, and thoſe of *b* have their planes parallel to it. Therefore, as the mill *a* turns round in common air, it is but little reſiſted thereby, becauſe its ſails cut the air with their thin edges: but the mill *b* is much reſiſted, becauſe the broad ſides of its ſails move againſt the air when it turns round. In each axle is a pin near the middle of the frame, which goes quite through the axle, and ſtands out a little on each ſide of it; upon theſe pins, the ſlider *d* may be made to bear, and ſo hinder the mills from going when the ſtrong ſpring *c* is ſet on bend againſt the oppoſite ends of the pins.

Having ſet this machine upon the pump-plate *LL* (fig. 8.) draw up the ſlider *d* to the pins on one ſide, and ſet the ſpring *c* at bend upon the oppoſite ends of the pins; then puſh down the ſlider *d*, and the ſpring acting equally ſtrong on each mill, will ſet them both agoing with equal forces and velocities: but the mill *a* will run much longer than the mill *b*, becauſe the air makes much leſs reſiſtauce againſt the edges of its ſails than againſt the ſides of the ſails of *b*.

Draw up the ſlider again, and ſet the ſpring upon the pins as before; then cover the machine with the receiver *M* (fig. 8.) upon the pump-plate, and having exhauſted the receiver of air, puſh down the wire *PP* (through the collar of leathers in the neck *q*) upon the ſlider; which will diſengage it from the pins, and allow the mills to turn round by the impulſe of the ſpring; and as there is no air in the receiver to make any ſenſible reſiſtance againſt them, they will both move a conſiderable time longer than they did in the open air; and the moment that one ſtops, the other will do ſo too.—This ſhews that air reſiſts bodies in motion, and that equal bodies meet with different degrees of reſiſtance, according as they preſent greater or leſs ſurfaces to the air, in the planes of their motions.

2 Take off the receiver *M* (fig. 11.) and the mills; and having put the guinea *a* and feather *b* upon the braſs flap *c*, turn up the flap, and ſhut it into the notch *d*. Then, putting a wet leather over the top of the tall receiver *AB* (it being open both at top and bottom) cover it with the plate *C*, from which the guinea and feather tongs *ed* will then hang within the receiver. This done, pump the air out of the receiver; and then draw up the wire *f* a little, which by a ſquare piece on its lower end will open the tongs *ed*; and the flap falling down, as at *c*, the guinea and feather will deſcend with equal velocities in the receiver; and both will fall upon the pump-plate at the ſame inſtant. *N.B.* In this experiment, the obſervers ought not to look at the top, but at the bottom of the receiver; in order to ſee the guinea and feather fall upon the plate; otherwiſe, on account of the quickneſs of their motion, they will eſcape the ſight of the beholders.

II. *To ſhew the weight of the air.*

1. Having fitted a braſs cap, with a valve tied over it, to the mouth of a thin bottle or Florence flaſk, whoſe contents are exactly known, ſcrew the neck of this cap into the hole *i* of the pump-plate; then, having exhauſted the air out of the flaſk, and taken it off from the pump, let it be ſuſpended at one end of a balance, and nicely counterpoiſed by weights in the ſcale at the other end; this done, raiſe up the valve with a pin, and the air will ruſh into the flaſk with an audible noiſe; during which time, the flaſk will deſcend, and pull down that end of the beam. When the noiſe is over, put as many grains into the ſcale at the other end as will reſtore the equilibrium; and they will ſhew exactly the weight of the quantity of air which has got into the flaſk, and filled it. If the flaſk holds an exact quart, it will be found, that 17 grains will reſtore the equipoiſe of the balance, when the quickſilver ſtands at $29\frac{1}{2}$ inches in the barometer; which ſhews, that when the air is at a mean rate of denſity, a quart of it weighs 17 grains; it weighs more when the quickſilver ſtands higher, and leſs when it ſtands lower.

2. Place the ſmall receiver *O* (fig. 8.) over the hole *i* in the pump-plate; and upon exhauſting the air, the receiver will be fixed down to the plate by the preſſure of the air on its outſide, which is left to act alone, without any air in the receiver to act againſt it: and this preſſure will be equal to as many times 15 pounds, as there are ſquare inches in that part of the plate which the receiver covers; which will hold down the receiver ſo faſt, that it cannot be got off, until the air be let into it by turning the cock *k*; and then it becomes looſe.

3. Set the little glaſs *AB* (fig. 12.) (which is open at both ends) over the hole *i* upon the pump-plate *LL*, and put your hand cloſe upon the top of it at B: then upon exhauſting the air out of the glaſs, you will find your hand preſſed down with a great weight upon it; ſo that you can hardly releaſe it, until the air be readmitted into the glaſs by turning the cock *k*; which air, by acting as ſtrongly upward againſt the hand as the external air acted in preſſing it downward, will releaſe the hand from its confinement.

4. Having tied a piece of wet bladder *b* (fig. 13.) over the open top of the glaſs *A* (which is alſo open at bottom) ſet it to dry, and then the bladder will be tight like a drum. Then place the open end *A* upon the pump-plate, over the hole *i*, and begin to exhauſt the air out of the glaſs. As the air is exhauſting, its ſpring in the glaſs will be weakened, and give way to the preſſure of the outward air on the bladder, which, as it is preſſed down, will put on a ſpherical concave figure, which will grow deeper and deeper, until the ſtrength of the bladder be overcome by the weight of the air; and then it will break with a report as loud as that of a gun.—If a flat piece of glaſs be laid upon the open top of this receiver, and joined to it by a flat ring of wet leather between them; upon pumping the air out of the receiver, the preſſure of the outward air upon the flat glaſs will break it all to pieces.

5. Immerſe the neck *cd* (fig. 14.) of the hollow glaſs ball *eb* in water, contained in the phial *aa*; then ſet it upon the pump-plate, and cover it and the hole *i* with the cloſe receiver *A*; and then begin to pump out the air. As the air goes out of the receiver by its ſpring, it will alſo by the ſame means go out of the hollow ball *eb*, through the neck *dc*, and riſe up in bubbles to the ſurface of the water in the phial; from whence it will make its way, with the reſt of the air in the receiver, through the air-pipe *GG* and valves *a* and *b*, into the open air. When it has done bubbling in the phial, the ball is ſufficiently exhauſted; and then, upon turning the cock *k*, the air will get into the receiver, and preſs ſo upon the ſurface of the water in the phial, as to force the water up into the ball in a jet, through the neck *cd*, and will fill the ball almoſt full of water. The reaſon why the ball is not quite filled, is becauſe all the air could not be taken out of it; and the ſmall quantity that was left in, and had expanded itſelf ſo as to fill the whole ball, is now condenſed into the ſame ſtate as the outward air, and remains in a ſmall bubble at the top of the ball; and ſo keeps the water from filling that part of the ball.

6. Pour ſome quickſilver into the jar D (fig. 15.) and ſet it on the pump plate near the hole *i*; then ſet on the tall open receiver *AB*, ſo as to be over the jar and hole; and cover the receiver with the braſs plate *C*. Screw the open glaſs tube *fg* (which has a braſs top on it at *h*) into the ſyringe *H*; and putting the tube through a hole in the middle of the plate, ſo as to immerſe the lower end of the tube *e* in the quickſilver at *D*, ſcrew the end *h* of the ſyringe into the plate. This done, draw up the piſton in the ſyringe by the ring *I*, which will make a vacuum in the ſyringe below the piſton; and as the upper end of the tube opens into the ſyringe, the air will be dilated in the tube, becauſe part of it, by its ſpring, gets up into the ſyringe; and the ſpring of the undilated air in the receiver acting upon the ſurface of the quickſilver in the jar, will force part of it up into the tube: for the quickſilver will follow the piſton in the ſyringe, in the ſame way, and for the ſame reaſon, that wa-

ter

ter follows the piston of a common pump when it is raised in the pump-barrel; and this, according to some, is done by suction. But to refute that erroneous notion, let the air be pumped out of the receiver *AB*, and then all the quicksilver in the tube will fall down by its own weight into the jar; and cannot be again raised one hair's breadth in the tube by working the syringe: which shews, that suction had no hand in raising the quicksilver: and, to prove that it is done by pressure, let the air into the receiver by the cock *k* (fig. 8.) and its action upon the surface of the quicksilver in the jar will raise it up into the tube, although the piston of the syringe continues motionless. If the tube be about 32 or 33 inches high, the quicksilver will rise in it very near as high as it stands at that time in the barometer. And, if the syringe has a small hole, as *m*, near the top of it, and the piston be drawn up above that hole, the air will rush through the hole into the syringe and tube, and the quicksilver will immediately fall down into the jar. If this part of the apparatus be air tight, the quicksilver may be pumped up into the tube to the same height that it stands in the barometer; but it will go no higher, because then the weight of the column in the tube is the same as the weight of a column of air of the same thickness with the quicksilver, and reaching from the earth to the top of the atmosphere.

7. Having placed the jar *A* (fig. 16.) with some quicksilver in it, on the pump-plate, as in the last experiment, cover it with the receiver *B* then push the open end of the glass-tube *de* through the collar of leathers in the brass neck *C* (which it fits so as to be air-tight) almost down to the quicksilver in the jar. Then exhaust the air out of the receiver, and it will also come out of the tube, because the tube is close at top. When the gauge *mm* shews that the receiver is well exhausted, push down the tube, so as to immerse its lower end into the quicksilver in the jar Now, although the tube be exhausted of air, none of the quicksilver will rise into it, because there is no air left in the receiver to press upon its surface in the jar. But let the air into the receiver by the cock *k*, and the quicksilver will immediately rise in the tube; and stand as high in it, as it was pumped up in the last experiment.

Both these experiments shew, that the quicksilver is supported in the barometer by the pressure of the air on its surface in the box, in which the open end of the tube is placed: and that the more dense and heavy the air is, the higher does the quicksilver rise; and, on the contrary, the thinner and lighter the air is, the more will the quicksilver fall. For, if the handle *F* be turned ever so little, it takes some air out of the receiver, by raising one or other of the pistons in its barrel: and consequently, that which remains in the receiver is so much the rarer, and has so much the less spring and weight; and thereupon, the quicksilver falls a little in the tube; but upon turning the cock, and re-admitting the air into the receiver, it becomes as weighty as before, and the quicksilver rises again to the same height. —Thus we see the reason why the quicksilver in the barometer falls before rain or snow, and rises before fair weather; for, in the former case, the air is too thin and light to bear up the vapours, and in the latter too dense and heavy to let them fall.

N. B. In all mercurial experiments with the air-pump, a short pipe must be screwed into the hole *i*, so as to rise about an inch above the plate, to prevent the quicksilver from getting into the air-pipe and barrels, in case any of it should be accidentally spilt over the jar; for if it once gets into the pipes or barrels, it spoils them, by loosening the solder, and corroding the brass.

8. Take the tube out of the receiver, and put one end of a bit of dry hazel-branch, about an inch long, tight into the hole, and the other end tight into a hole quite through the bottom of a small wooden cup: then pour some quicksilver into the cup, and exhaust the receiver of air; and the pressure of the outward air, on the surface of the quicksilver, will force it through the pores of the hazel, from whence it will descend in a beautiful shower into a cup placed under the receiver to catch it.

9. Put a wire through the collar of leathers in the top of the receiver, and fix a bit of dry wood on the end of the wire within the receiver; then exhaust the air, and push the wire down, so as to immerse the wood into a jar of quicksilver on the pump-plate: this done, let in the air; and upon taking the wood out of the jar, and splitting it, its pores will be found full of quicksilver, which the force of the air, upon being let into the receiver, drove into the wood.

10. Join the two brass hemispherical cups *A* and *B* (fig. 17.) together, with a wet leather between them, having a hole in the middle of it; then screw the end *D* of the pipe *CD* into the plate of the pump at *i*, and turn the cock *E*, so as the pipe may be open all the way into the cavity of the hemispheres; then exhaust the air out of them, and turn the cock a quarter round, which will shut the pipe *CD*, and keep out the air. This done, unscrew the pipe at *D* from the pump, and screw the piece *Fh* upon it at *D*; and let two strong men try to pull the hemispheres asunder by the rings *g* and *h*, which they will find hard to do; for if the diameter of the hemispheres be four inches, they will be pressed together by the external air with a force equal to 188 pounds. And to shew that it is the pressure of the air that keeps them together, hang them by either of the rings upon the hook *P* of the wire in the receiver *M* (fig. 8.) and upon exhausting the air out of the receiver, they will fall asunder of themselves.

11. Place a small receiver *O* (fig 8.) near the hole *i* on the pump-plate, and cover both it and the hole with the receiver *M*; and turn the wire so by the top *P*, that its hook may take hold of the little receiver by a ring at its top, allowing that receiver to stand with its own weight on the plate. Then, upon working the pump, the air will come out of both receivers; but the large one *M* will be forcibly held down to the pump by the pressure of the external air; whilst the small one *O*, having no air to press upon it, will continue loose, and may be drawn up and let down at pleasure, by the wire *PP* But, upon letting it quite down to the plate, and admitting the air into the receiver *M*, by the cock *k*, the air will press so strongly upon the small receiver *O*, as to fix it down to the plate; and at the same time, by counterbalancing the outward pressure on the large receiver *M*, it will become loose. This experiment evidently shews, that the receivers are held down by pressure, and not by suction, for the internal receiver continued loose whilst the operator was pumping, and the external one was held down; but the former became fast immediately, by letting in the air upon it.

12 Screw the end *A* (fig. 18.) of the brass pipe *ABF* into the hole of the pump-plate, and turn the cock *e* until the pipe be open; then put a wet leather upon the plate *cd*, which

which is fixed on the pipe, and cover it with the tall receiver *GH*, which is close at top; then exhaust the air out of the receiver, and turn the cock *e* to keep it out; which done, unscrew the pipe from the pump, and set its end *A* into a bason of water, and turn the cock *e* to open the pipe; on which, as there is no air in the receiver, the pressure of the atmosphere on the water in the bason will drive the water forcibly through the pipe, and make it play up in a jet to the top of the receiver.

13. Set the square phial *A* (fig 21.) upon the pump-plate; and having covered it with the wire-cage *B*, put a close receiver over it, and exhaust the air out of the receiver; in doing of which, the air will also make its way out of the phial through a small hole in its neck under the valve *b*. When the air is exhausted, turn the cock below the plate, to re-admit the air into the receiver; and as it cannot get into the phial again, because of the valve, the phial will be broke into some thousands of pieces by the pressure of the air upon it. Had the phial been of a round form, it would have sustained this pressure like an arch, without breaking; but as its sides are flat, it cannot.

To shew the elasticity or spring of the air.

14. Tie up a very small quantity of air in a bladder, and put it under a receiver; then exhaust the air out of the receiver, and the small quantity which is confined in the bladder (having nothing to act against it) will expand itself so by the force of its spring, as to fill the bladder as full as it could be blown of common air. But upon letting the air into the receiver again, it will overpower the air in the bladder, and press its sides almost close together.

15. If the bladder so tied up be put into a wooden box, and have 20 or 30 pounds weight of lead put upon it in the box, and the box be covered with a close receiver; upon exhausting the air out of the receiver, that air which is confined in the bladder will expand itself so, as to raise up all the lead by the force of its spring.

16. Take the glass-ball mentioned in the fifth experiment, (fig. 14.) which was left full of water all but a small bubble of air at top; and having set it with its neck downward into the empty phial *aa*, and covered it with a close receiver, exhaust the air out of the receiver, and the small bubble of air in the top of the ball will expand itself, so as to force all the water out of the ball into the phial.

17. Screw the pipe *AB* (fig. 18.) into the pump-plate, place the tall receiver *GH* upon the plate *cd*, as in the twelfth experiment, and exhaust the air out of the receiver: then, turn the cock *e*. to keep out the air; unscrew the pipe from the pump, and screw it into the mouth of the copper vessel *CC* (fig. 22.) the vessel having first been about half filled with water. Then turn the cock *e* (fig. 18.) and the spring of the air which is confined in the upper vessel will force the water up through the pipe *AB* in a jet into the exhausted receiver, as strongly as it did by its pressure on the surface of the water in a bason, in the twelfth experiment.

18. If a fowl, a cat, rat, a mouse, or bird, be put under a receiver, and the air be exhausted, the animal will be at first oppressed as with a great weight, then grow convulsed, and at last expire in all the agonies of a most bitter and cruel death.

19. If a butterfly be suspended in a receiver, by a fine thread tied to one of its horns, it will fly about in the receiver, as long as the receiver continues full of air; but if the air be exhausted, though the animal will not die, and will continue to flutter its wings, it cannot remove itself from the place where it hangs in the middle of the receiver, until the air be let in again, and then the animal will fly about as before.

20. Pour some quicksilver into the small bottle *A* (fig. 19.) and screw the brass collar *c* of the tube *BC* into the brass neck *b* of the bottle, and the lower end of the tube will be immersed into the quicksilver, so that the air above the quicksilver in the bottle will be confined there, because it cannot get out about the joinings, nor can it be drawn out through the quicksilver into the tube. This tube is also open at top, and is to be covered with the receiver *G* and large tube *EF*, which tube is fixed by brass collars to the receiver, and is close at the top This preparation being made, exhaust the air both out of the receiver and its tube; and the air will by the same means be exhausted out of the inner tube *BC*, through its open top at *C*; and as the receiver and tubes are exhausting, the air that is confined in the glass bottle *A* will press so by its spring upon the surface of the quicksilver, as to force it up in the inner tube as high as it was raised in the ninth experiment by the pressure of the atmosphere; which demonstrates that the spring of the air is equivalent to its weight.

21. Screw the end *C* (fig. 20.) of the pipe *CD* into the hole of the pump-plate, and turn all the three cocks *d*, *G*, and *H*, so as to open the communications between all the three pipes *E*, *F*, *DC*, and the hollow trunk *AB*. Then, cover the plates *g* and *h* with wet leathers, which have holes in their middle where the pipes open into the plates; and place the close receiver *I* upon the plate *g*: this done, shut the pipe *F* by turning the cock *H*, and exhaust the air out of the receiver *I*. Then turn the cock *d*, to shut out the air; unscrew the machine from the pump; and having screwed it to the wooden foot *L*, put the receiver *K* upon the plate *h*: this receiver will continue loose on the plate as long as it keeps full of air; which it will do until the cock *H* be turned to open the communication between the pipes *F* and *E*, through the trunk *AB*; and then the air in the receiver *K*, having nothing to act against its spring, will run from *K* into *I*, until it be so divided between these receivers, as to be of equal density in both; and they will be held down with equal forces to their plates by the pressure of the atmosphere, though each receiver will then be kept down but with one half of pressure upon it that the receiver *I* had when it was exhausted of air; because it has now one half of the common air in it which filled the receiver *K* when it was set upon the plate; and therefore a force equal to half the force of the spring of common air will act within the receivers against the whole pressure of the common air upon their outsides This is called transferring the air out of one vessel into another

22. Put a cork into the square phial *A*, (fig. 21.) and fix it in with wax or cement; put the phial upon the pump-plate with the wire-cage *B* over it, and cover the cage with a close receiver. Then, exhaust the air out of the receiver; and the air that was corked up in the phial will break the phial outwards by the force of its spring, because there is no air left on the outside of the phial to act against the air within it.

22. Put a shrivelled apple under a close receiver, and exhaust the air; then the spring of the air withing the apple will plump it out, so as to cause all the wrinkles disappear; but

Plate CXLV

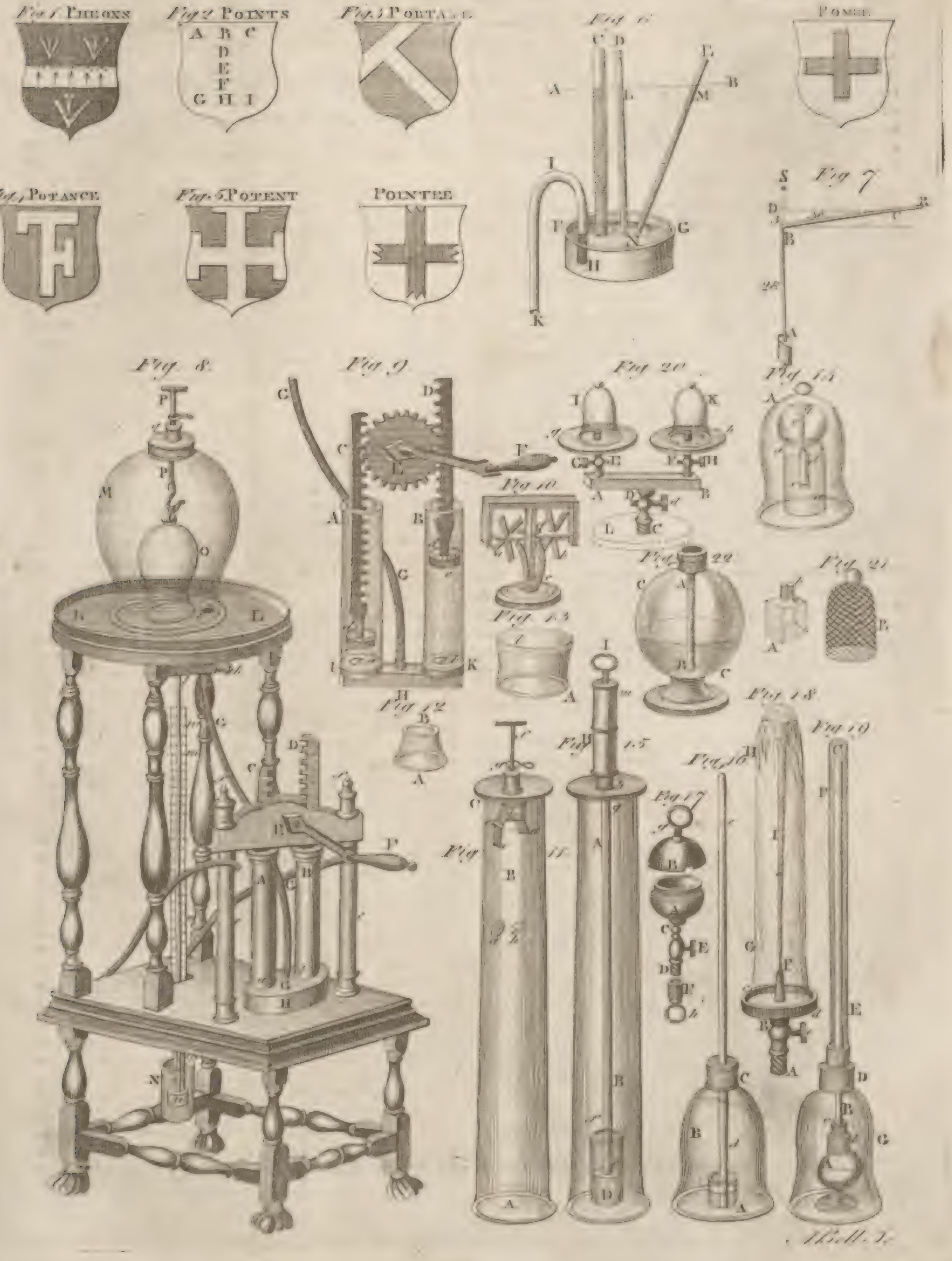


Fig. 1 Pheons
Fig. 2 Points
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Fig. 8
Fig. 9
Fig. 10
Fig. 11
Fig. 12
Fig. 13
Fig. 14
Fig. 15
Fig. 16
Fig. 17
Fig. 18
Fig. 19
Fig. 20
Fig. 21
Fig. 22

but upon letting the air into the receiver again, to preſs upon the apple, it will inſtantly return to its former decayed and ſhrivelled ſtate.

23. Take a freſh egg, and cut off a little of the ſhell and film from its ſmalleſt end; then put the egg under a receiver, and pump out the air; upon which, all the contents in the egg will be forced out into the receiver, by the expanſion of a ſmall bubble of air contained in the great end, between the ſhell and film.

34. Put ſome warm beer in a glaſs; and having ſet it on the pump, cover it with a cloſe receiver, and then exhauſt the air. Whilſt this is doing, and thereby the preſſure more and more taken off from the beer in the glaſs, the air therein will expand itſelf, and riſe up in innumerable bubbles to the ſurface of the beer; and from thence it will be taken away with the other air in the receiver. When the receiver is near exhauſted, the air in the beer, which could not diſentangle itſelf quick enough to get off with the reſt, will now expand itſelf ſo, as to cauſe the beer to have all the appearance of boiling; and the greateſt part of it will go over the glaſs.

25. Put ſome warm water in a glaſs, and put a bit of dry wainſcot or other wood into the water, Then, cover the glaſs with a cloſe receiver, and exhauſt the air; upon which, the air in the wood having liberty to expand itſelf, will come out plentifully, and make all the water to bubble about the wood, eſpecially about the ends, becauſe the pores lie lengthwiſe. A cubic inch of dry wainſcot has ſo much air in it, that it will continue bubbling for near half an hour together.

Of WINDS.

AS the air is a fluid, ſubjected to the ſame laws of gravitation as other fluids, it neceſſarily has a conſtant tendency to preſerve an equilibrium in every part; ſo that, if by any means whatever it is rendered lighter in any one place than another, the weightier air will ruſh in from every ſide towards this place, till as much be there accumulated as makes it of an equal weight with the reſt of the atmoſphere: It is theſe currents of air which are called *winds*.

Many are the cauſes which may vary the weight of the atmoſphere, and occaſion particular topical winds.

Although other cauſes may occaſion winds in certain circumſtances, yet their principal and moſt univerſal cauſe is the ſun, which warmeth the air to a much greater degree in ſome places of the atmoſphere than in others; and as the air is ſuſceptible of a great degree of expanſion by heat in thoſe places where it is heated to any conſiderable degree, it is expanded ſo much as to become lighter than the air in thoſe places where it is colder; ſo that the weightier cold air from all the circumjacent parts ruſhes towards this point to reſtore the equilibrium which had been deſtroyed So that if there be any particular part upon the earth's ſurface where the ſun acts conſtantly with greater force than on any other part, a current of air will conſtantly flow from theſe towards the warmer region: but the ſun acts with greater force upon thoſe parts of the earth which are neareſt the *Equator*, than thoſe which approach towards either *Pole*; ſo that we might naturally expect that a wind would conſtantly blow from the polar regions towards the Equator; which is really found to be the caſe in the *Torrid Zone*, where the influence of the ſun overcomes almoſt all the other leſſer cauſes which produce the variable winds in our more northerly regions. However, even in the Torrid Zone, theſe north and ſouth winds are varied in different ways.

Although the heat of the equatorial region is greater than any other; yet as the ſun acts perpendiculaaly in his diurnal courſe upon one point of the equator only at one time, and immediately paſſes over it; and as the air retains the heat communicated to it by the ſun but for a ſhort time, cooling gradually as he retires, and continuing ſtill to decreaſe till his influence again returns the following day; the degree of heat upon this great circle muſt be very different in different parts, and perpetually varying in every point; which muſt in ſome meaſure tend to diſturb thoſe winds coming from the polar regions, which we have already mentioned. To comprehend clearly what will be the effects of this rotation, let us conſider what effect it would naturally produce upon the equator with regard to wind, ſuppoſing no other cauſe ſhould interrupt it. And here we muſt obſerve, that as the point upon which the ſun acts with the greateſt power is conſtantly moving from eaſt to weſt, the air to the eaſt of that point over which the ſun has more lately paſſed will be more rarefied than that to the weſt, and will naturally flow towards that point from eaſt to weſt with greater velocity than from weſt to eaſt, as the cool air to the weſt of that point will be interrupted in its motion towards it by the motion of the ſun meeting it. Hence therefore it follows, that from the diurnal motion of the earth from weſt to eaſt a conſtant eaſt wind would always be produced, were it not obſtructed by other cauſes. But as there is a conſtant ſtream of air flowing from the polar towards the equatorial regions, a compoſition of theſe two currents of air acting at the ſame time will produce a north-eaſt wind in all parts of the northern hemiſphere, and a ſouth-eaſt wind in all parts of the ſouthern one. Theſe winds are known by the name of *the general trade-winds*.

If there were no inequalities on the ſurface of our globe, and if it were compoſed of a ſubſtance perfectly homogeneous, this wind would invariably take place at all times on every part of the earth's ſurface; but as this is not the caſe, it is liable to ſeveral very conſiderable variations. In all thoſe regions towards the poles, as the influence of the ſun is there but weak, other leſſer cauſes occaſion particular winds, and diſturb that regularity which at firſt view we might expect, ſo that the *general trade wind* does not invariably take place beyond the 28th or 30th degree of latitude; and the regions between that and the poles have nothing but variable winds. Even in the Torrid Zone, there are many cauſes which in particular places alter this direction of the wind; ſo that the *genuine trade-winds* do not take place except in the Atlantic and Pacific oceans on each ſide the equator to the diſtance of 28 or 30 degrees, and in the greateſt part of the Indian ocean to the ſouth of the Equator as appears, more diſtinctly upon the MAP; ſee Plate CXLVI. where the courſe of the winds are marked by the direction of the *ſtrokes*, the *darts* pointing in the ſame direction as the wind blows.

Having thus explained the nature and cauſes of the general trade wind, we now proceed to take notice of the principal deviations which take place in the Torrid Zone. The general trade-wind, when thus altered at particular ſeaſons, is known by the name of *monſoons*. There are other variations, which, although as general, are yet of ſmaller and more limited influence. Theſe are known by the name of *breezes*; and as they blow periodically from the ſea, they are denominated *ſea* or *land breezes*, and take place more or

or lefs in every fea coaft within the tropics. As the caufes of the monfoons will be more clearly comprehended after the nature of thefe breezes is explained, we fhall firft confider them.

The fea and land breezes of the Torrid Zone are gentle periodical winds regularly fhifting twice every day, and blowing from the fea towards the land during the day time, and from the land towards the fea in the night. Thefe breezes do not blow with an equal degree of force throughout the whole day and night, but are perpetually varying, being always ftrongeft about mid-day and midnight, and becoming gradually weaker till the time of change in the evening and morning; about which time the air continues for a fhort fpace perfectly calm: but in a little the breeze begins to be felt on the fide oppofite to that from which it blew laft, fo faint at firft as hardly to be perceived; but by degrees acquiring greater ftrength, it goes on increafing for five or fix hours, after which it again as gradually finks and dies away. They always blow directly off or towards the fhore, and never extend their influence to a great diftance from it, although this is varied by particular circumftances in different places; as they never extend fo far from the points of capes and promontories, as in deep bays; nor upon the windward, as lee-fhores.

Thefe breezes are produced by the fame caufe which gives rife to the trade-wind, *viz.* the heat of the fun. In thefe warm regions the days and nights are nearly of an equal length throughout the whole year; the fun rifing high in the day time, and defcending almoft perpendicularly at night; which occafions a much greater variation between the heat of the day and night than is experienced in the more temperate climates; and it is this great difference between the heat of the night and day which produces the *breezes*. For the rays of the fun are reverberated from the land during the day-time, much more powerfully than from the fea, whofe furface is conftantly evaporating; and the air above the land is rendered much warmer, and confequently more rarified, than above the fea; fo that a current of air neceffarily takes place at that time from the fea towards the land, increafing and diminifhing in ftrength as the heat increafes or declines. But when the fun defcends below the horizon, the evaporation from the furface of the fea is ftopt, or greatly diminifhed, and the cold which it occafioned is of confequence removed: the reverberation of the fun's rays from the furface of the earth is likewife removed, and the air above the land quickly refumes its natural degree of cold, which is always greater than the fea, when the influence of the fun is withdrawn; fo that the air above the fea becomes warmer during the night than that above the land, and a current of air is of courfe eftablifhed from the land to the fea, which forms the land-breeze, which acts as uniformly, although lefs powerfully, than the fea-breeze; blowing at firft gently as the air begins to cool, and gradually gathering ftrength as the fun retires below the horizon; till his influence begins to be full again in the morning, when it gradually gives place to the more powerful influences of the fea-breeze. Thefe breezes are not, however, entirely confined to the Torrid Zone. They are even felt in more northern regions: the fea-breeze in particular being almoft as perceptible during the fummer feafon along the coafts of the Mediterranean and the Levant, both on the African, and European and Afiatic fhores, as within the tropics. Even in our own colder climate, the effects of this are often fenfibly felt during the fummer feafon; although, from the length of the day and fhortnefs of the night, the difference between the heat of thefe is far lefs than in warmer climates. And although the fhortnefs of our nights prevents us from feeling a nocturnal breeze, fimilar to the land-breezes of the Torrid Zone; yet in every ferene evening we have an opportunity of obferving a phenomenon, proceeding from a fimilar caufe with that which occafions them in warmer climates. For as the waters retain their heat longer than the earth after the fun withdraws, the moifture which was raifed during the heat of the day to a fmall diftance from the earth's furface is quickly condenfed by the cold of the evening, and falls down in copious dews; whereas that which is above the furface of the water is more flowly condenfed, by reafon of the heat which that element retains longer, and hovers at a fmall diftance above it in the form of a denfe vapour, which flowly fubfides as it lofes its heat. This is the caufe of thofe low mifts which are fo often feen hovering above the furface of rivers and other waters in the evenings towards the end of fummer.

It was already obferved, that in the Indian ocean the general trade-wind only took place in fome parts to the fouth of the Equator. To the north of the line, and in fome places to the fouth of it in that ocean, the general trade-wind only blows regularly for fix months, and during the other fix months the wind blows in a direction entirely oppofite. It is thefe winds, which fhift thus regularly, which are called *Monfoons*, although they are alfo fometimes called trade-winds.

At the Equator the days and nights are always of an equal length throughout the whole year; fo that the heat being thus equally divided, it never arives to fuch an intenfe degree as to be infupportable to the inhabitants. And as there is no viciffitude of feafons at the Equator, fo at the Poles they never experience the more pleafing viciffitudes of day and night, the fun never fetting during the fummer feafon, nor rifing above the horizon during the winter: and although the day decreafes in length as we recede from the pole, from fix months to twenty-four hours; yet in all high latitudes the fun defcends for fuch a fhort fpace below the horizon, and in fuch an oblique direction, that the difference between the heat of the day and night is but very inconfiderable. From which it follows, that during this feafon, when the fun continues to act with fuch uninterrupted influence upon the furface of the earth, the air will then be rarified more above the dry land than upon the furface of the water; fo that a wind would naturally fet in at that time from the fea towards the land, fimilar to the diurnal fea-breezes in the warmer climates; and on the contrary, during the winter feafon, the air in thefe northern regions being colder above the land than the water, the winds will naturally blow from the land towards the fea, fimilar to the land-breezes of the Torrid Zone. But as the influence of the fun, although of longer continuance, is in general more languid in climates of a high latitude than in thofe near the *line*, it is not to be expected that thefe effects will follow with the fame regularity as in the Torrid Zone; being more apt to be interrupted by leffer caufes which affect the atmofphere and produce winds in different directions. Yet thefe are not fo totally interrupted, but that we can eafily trace their effects even in our own cold climate: For during the fummer feafon, the large continent to the eaft of us, being more heated than the Atlantic ocean weftward, produces

I.

A View of the GENERAL and

N. B. *The arrows among the*

N. B. The exact point where the S. E an c
of the wind on each side of the equator, at f ns
to us more probable, that this point varies acc r-
vations are wanting to confirm this.

Neither is it easy to ascertain, with precision e
to the south of the equator, extend west from

duces a general tendency of the current of air towards the *east*, insomuch that *westerly* winds are observed to prevail more than any other, not only here, but in all the frontier countries on the continent, during the *summer* season. And *easterly* winds become again more prevalent in the *winter* and *spring*. On the contrary, it is observed in *North America*, that the *easterly* winds prevail more in *summer* than at any other time; and the *west* winds always prevail during the cold months of *winter*. The same effects take place with a greater degree of constancy in other parts of Europe, particularly in *Greece*, and the countries in that neighbourhood; as the ancient Greeks have particularly remarked, that the winds blew from the *south* during the *heat of summer*, particularly about the *dog-days*, and from the north during the colder weather of *winter*.

Any attentive reader, who has accompanied us thus far, will readily see that the *monsoons* which take place in the *Indian ocean* proceed from the same general cause. For when the sun, in his annual course, has crossed the *line*, and comes to act very strongly upon the extensive countries of *Arabia*, *Persia*, *China*, and the other parts of *India*, these become heated to a much higher degree than the ocean to the south of them; and the air above these extensive countries being so much rarefied, naturally draws the wind towards that place, which, by overcoming the general trade-wind, produces the *southerly monsoons* which take place in all those seas during the months of *April*, *May*, *June*, *July*, *August*, and *September*. But when the sun has again retreated towards the southern hemisphere, this great degree of heat in these countries subsides, and the genuine trade-wind again resumes its natural course; forming what they call the *northerly monsoon*, which blows in the months of *October*, *November*, *December*, *January*, *February*, and *March*: and as the continent of Asia now assumes a greater degree of cold than the Atlantic or Pacific oceans in the same latitude, it produces a brisker and more steady gale during the continuance of this monsoon, than is ever experienced in the general trade wind.

Having thus explained the nature of the *monsoons* in general, we shall proceed to consider the particulars which influence the direction of these in those parts where they take place. In all that part of the Indian ocean which lies between the island of *Madagascar* and *Cape Commorin*, the wind blows constantly from the W. S. W. between the months of *April* and *October*; and in the opposite direction from the month of *October* till *April*, although with some variation in different places, as these winds are neither so strong nor constant in the *Bay of Bengal* as in the Indian ocean. And it is likewise remarkable, that the S. W. winds in these seas are generally more *southerly* on the *African* side, and more *westerly* on the *Indian*, as appears distinctly in the map. But these variations are not repugnant to the general theory. For it is sufficiently known, that high lands in every part of the globe are much colder than low and flat countries; and as that part of *Africa* is very high and mountainous, the cold in these regions is much greater than in the more flat countries of *Arabia* and *India*; so that the wind naturally blows from these cold regions, in the summer season, towards the warmer continent of *Asia*; which occasions those inflections of the wind to the eastward which take place in these seas during the summer months; and is still farther assisted by the peninsula of *India*, the kingdom of *Siam*, and the islands of *Sumatra* and *Java*, on the eastern part of this ocean, lying so much farther south than the kingdoms of *Arabia* and *Persia*; so that these, being more heated than the ocean to the *westward*, naturally draw the wind towards them, and produce the *easterly* variation of the monsoon which takes place in this part of the ocean, while the warm and sandy desarts of *Arabia* draw the winds more directly *northward* near the *African* coast.

In the eastern parts of the *Indian ocean*, beyond the island of *Sumatra*, through the gulf of *Siam* and bay of *Tonquin*, and along the southern parts of *China*, and among the *Philippine islands*, *&c.* to the north of the Equator, the monsoons observe a different direction, blowing nearly due *south* and *north*. Here the greatest part of the warm continent is to the west of this district, which makes the wind naturally assume this direction. A little to the east of this, among the *Mariamne islands*, the general trade-wind takes place, there being no continent to the north of them to occasion monsoons.

The monsoons are as regular in the eastern part of the *Indian ocean* to the *south* of the Equator, as they are to the *north* of it; as here a *northern* monsoon sets in from the month of *October* till *April*, and a *southern* from *April* till *October*. And here, as to the north of the *line*, we find the direction of the monsoons varying according to particular circumstances in different places: for about the island of *Sumatra*, and towards the west end of *Java*, the monsoons set in nearly from the *north* and *south*; but toward *Celebes* and *Timur*, they begin to tend a little more to the *east* and *west*, gradually declining as they approach the coast of *New Guinea*, near to which the *northerly monsoon* from *October* till *April* blows from the N. W. and the opposite monsoon from the S. E. between *October* and *April*. The reader will easily perceive that these monsoons are occasioned by the continent of *New Holland* and *Guinea*, which being heated by the sun when in the southern signs, draws the wind towards that in the summer season, in the same manner as the continent of *Asia* produces the monsoons to the north of the line. And it is likewise sufficiently plain, that the inflection of these periodical winds about *Celebes* and *Timur* is occasioned by that part of the continent called *New Guinea* jutting out so near to the Equator to the east of these, and drawing the wind toward that quarter.

These are the most general and extensive monsoons which take place in our globe. But there are other periodical winds, which occur in particular places in these warm regions, that deserve particular attention.

In the *Red-Sea*, the monsoon shifts as regularly as in other places; but being influenced by the coasts, it tends a little more to the north and south than in the Indian ocean.

On the south coast of *Africa*, to the south of *C. Corientes*, and about the southern parts of the island of *Madagascar*, the regular trade-wind from the S. E. takes place between *October* and *April*; but from *April* till *October* the wind blows from the W. or N. W., and is at that season exceedingly cold. This is evidently occasioned by a cause already taken notice of: for, notwithstanding the high and cold nature of this continent, yet when the sun is to the south of the *line*, his powerful influence at that season so far abates their natural degree of cold, as not to interrupt the general trade-wind between the months of *October* and *April*: But when he returns to the northern hemisphere, the high mountains of *Africa* resume their native coldness, and repel the general trade-winds by their cold and more power-

ful

ful blast, so as to produce the intemperate monsoon which here takes place between the months of *April* and *October*.

From *Mozambique*, to cape *Guardafoy*, at the mouth of the *Red Sea*, the monsoons are a little more irregular than in the other parts of the *Indian ocean*. For it is observed, that between *October* and *January* the winds are variable, although chiefly from the *north*. In *January* the N. E. monsoon sets in, and continues regular till the month of *May*. From *May* till *October* the winds again become variable, but blow chiefly from the *southern* points; but in the months of *June*, *July*, and *August*, there are frequent calms, especially about the bay of *Melinda*, which sometimes continue for several weeks together, and extend only about a hundred leagues from shore.

Before we can explain the cause of this irregularity clearly, it will be necessary to attend to the direction of the wind on each side of this track at each particular season. In the months of *October*, *November*, and *December*, the winds are here variable, but chiefly from the north. Now during these three months, the wind to the south of this beyond *C. Corientes* blows from the S. E. at the *Red Sea*, and all to the north of this the wind during this season of the year is from the N. E. And as the sun is then perpendicular to the bay of *Melinda*, these opposite winds here meeting and opposing one another, and being both of them stopt in their course westward by the cold regions of *Africa* near the Mountains of the Moon, will naturally produce the variable winds here observed according as the one or the other of these three balancing powers shall predominate: although, as the coast here runs away towards the *south-west*, it is natural to expect that the northerly wind, which follows the same direction, should more frequently prevail than those which are opposed by it; especially when we consider, that the island of Madagascar, now beginning to be warmed by the influence of the sun, will concur in drawing the wind to the southward; and when the continent of *Africa* is more heated in the months of *January* and *February*, it does not oppose the easterly monsoon, so that the winds become then more fixed than before. But in the months of *June*, *July*, and *August*, the wind to the south of *C. Corientes* is from the N. W.; and near the *Red Sea*, and throughout the northern part of the *Indian ocean*, the S. W. monsoon is then in its greatest vigour; so that on each end of this district the wind is blowing in an opposite direction; from which results these calms about *Melinda*, which we just now mentioned.

This much may suffice for the shifting winds on the *African* and *Asiatic* coasts. As to *America*, the only places where the wind shifts regularly are, the bays of *Honduras* and *Campeachy* on the *east*, and that of *Panama* and some parts on the coast of *Mexico* on the *west*, with a small track upon the coast of Brazil. In the south part of the bay of *Honduras*, between *C. Gratia de Dios* and *C. la Bela*, the common trade-wind between E and NE blows between *March* and *November*; from *October* till *March*, there are westerly winds; not constant or violent, but blowing moderately sometimes two or three days, or a week; and then the easterly breeze may again prevail for an equal length of time. The reason of the peculiarity here observed is this. During the summer season, the high land on the *Isthmus of Darien* is so much warmed as not to interrupt the course of the general trade-winds. But when he retires to the southern hemisphere, the cold upon the *Isthmus* at that season becomes so great, as to condense the air to such a degree as to repell the trade-wind for some time: but not being cooled to such an intense degree as in some of the larger continents, the trade-wind at times overcomes and repells these land breezes in its turn, and produces the phenomena above described. And that this is really the case, appears evident from this circumstance, that the *land-breezes* are most prevalent and of longest duration in the coldest months of *December* and *January*; before and after which two months, the trade-wind being generally checked, only a day or two about the full or change of the moon. As these western breezes on this coast take their rise from the same cause as the duirnal land-breeze in warm climates, they may be considered as *land-breezes* of two or three days continuance, and forming an intermediate step between the *land-breezes* and *monsoons*. Although the influence of these *breezes* is felt farther off at sea than the common *diurnal breeze*, yet they do not extend a great way, being seldom felt above twenty or thirty or forty leagues from shore; and about *C. La Vela*, which is much exposed to the east wind, these breezes seldom extend above eight or ten leagues from shore. Land breezes of the same nature, and proceeding from similar causes, are also experienced in the winter season in the *bay of Campeachy* which are there known by the name of *Summasenta* winds. Beyond *C. la Vela* these western breezes are not felt, which is undoubtedly occasioned by the whole of that coast as far as *C. St Augustine* being so much exposed to the general trade-wind, which here sweeps along the coast with so much violence as almost totally to repress the weaker influence of the *breezes*. But between *C. St Augustine* and *St Catharine's island*, or a little farther, we again meet with a variation of the wind at different seasons, as it is here observed to blow in an E or NE direction from *September* till *April*; and from *April* till *September* from the SW. This variable wind, or monsoon, like the others on this coast, extends but for a very short way from shore, and is evidently occasioned by the same causes as the other periodical winds. For, in the summer-months, (which in this climate is between *September* and *April*, the land of the continent being heated by the sun, draws the trade-wind from its common course of SE, a little to the westward; and as the coast here tends towards the SW, the wind in some measure (as it always does) follows the same direction, and produces this ENE *monsoon*. But, in the winter, when this region becomes more cool, the east wind is repelled by the dense cold air from the mountains; by which means it is bent to the northward, and is forced along the coast to *C. St Augustin*; where meeting with no further hindrance, it again falls in with the general trade-wind, and is carried along with it in its proper direction.

We have purposely omitted mentioning the winds on the west coasts of *Africa* and *America*, till the others were explained, as the causes of the peculiarities here observed will be now more easily comprehended. On the coasts of *Chili* and *Peru*, in *America*, from 25° or 30° of south latitude to the line; and on the parallel coast of *Angola*, &c. in *Africa*, the wind blows all the year from the south, varying in its direction a little in different places according to the direction of the coast, towards which it always inclines a little. But whatever is the direction at any one place, it continues the same throughout the whole year without

any

any variation, and always blows from some southerly point. But there is this difference between this wind upon the coasts of *Chili* and *Angola*, that it extends much farther out to sea upon the former than upon the latter.

In order to explain the cause of this singular phenomenon, it is necessary to recollect, that the general trade-wind is produced by the concurrence of two separate causes. One is the great heat of the equatorial region, by which alone would be produced a constant north or south wind. The other is the diurnal revolution of the earth, which would cause a perpetual tendency of the air in these warm regions from east to west. From the concurrence of these two causes result the general trade-wind, which would constantly blow from the SE or NE, as we have already demonstrated. But if any one of these two causes, in any particular place, is prevented from producing its full effect, while the other continues to exert its influence, the general direction of the wind will be varied, and it will assume another. Thus, if the *east* wind was prevented from acting in any particular place, while nothing interrupted the *south* or *north wind*, it is evident that the air would rush towards the equator in that direction which was nearest and easiest, whether that should be pointing eastward or westwatd. Now as the high mountains in the internal parts of *Africa* and *America* interrupt the course of the east wind near the surface of the earth, while these coasts of which we now treat are entirely open to the south, the wind naturally rushes along the coasts of *Chili* and *Angola* from north to south; and as the low lands near the shore, in these warm regions, is generally warmer than the sea, the wind will naturally point in towards the shore, as is generally observed to happen.

This, then, is the obvious cause of the south wind which always prevails upon the coasts of *Chili* and *Peru*, as well as along the shores of *Angola*, *Loango*, &c. But it is only near the shore that this can take place; nor can it extend to a great height above these low and fertile regions. For as the internal parts of these countries are exceedingly high; but more especially the *Andes* of *America*, which experience a perpetual degree of cold more intense than some polar regions ever experience; the air must here be condensed to a very great degree, and send forth from these high regions a perpetual wind to every side, which occasions almost all the peculiarities that have been remarked in these climates: For by opposing the general current of the trade-wind upon the eastern part of these continents, they proproduce these deluges of rain which supply the immense rivers of the *Amazons*, *La Plata*, *&c.* these do not, like the *Nile* and *Gambia*, swell only at a particular season, and then shrink into a diminutive size again, but continue throughout the whole year, with less variation of size, to pour their immense floods of water into the ocean. These cold winds likewise stretching to the westward, at a considerable distance above the warmer regions of the sea-coast, at length descend as low as the ocean, and form the general trade-wind, and occasion that unusual degree of cold which mariners have so often complained of even under the *line* to the westward of America. To the same cause also must we attribute the thick fogs so common upon the southern parts of *Chili* and along the coasts of *Peru*, with the other peculiarities of that singular climate about *Lima* and the kingdom of *Valles* in South America; for the vapours which are exhaled in such great abundance in the warm regions on the sea shore, are, at a little height above the earth, condensed by the cold winds which come from the mountains, and form these thick mists which are so often observed in this climate. The same effects are felt in some degree on the similar coast of Africa. But as the mountains of *Africa* are not so high as the *Andes* of *America*, nor approach so near the western coast, the effects are less sensible here than in *America*. The great height of the *Andes* above the mountains of the similarly situated country of *Africa*, is the only reason why the effects on that coast are not felt to an equal degree, although similar in kind.

A more singular deviation from the general trade-wind is observed to take place on the *African* and *American* coasts to the north of the line, than those we have taken notice of to the south of it. For it is observed, that from *California* to the bay of *Panama*, all along the coasts of *New Spain*, the winds blow almost constantly from the west or SW, nearly directly opposite to the trade-wind; and on the coast of *Africa* from *C. Bayador* to *C. Verde*, they blow chiefly from the NW, standing in upon the shore; from thence the wind bends gradually more and more from the north to the west, and so round to the SW, all along the coast of *Guinea*, as will be distinctly seen by the map. After what we have said of the winds on the southern parts of these regions, it will be unnecessary to spend much time in explaining the cause of these peculiarities, as it will evidently appear that they are nearly the same, the variations here observed being occasioned by the particular direction of the coast. Thus, along the coast of *New Spain*, the wind blows nearly the same direction in every place, as there are no remarkable bendings on the coast; being uniformly drawn towards the shore, by the great heat of the low part of the continent near the sea; which in these regions is always more heated than the water of the ocean, and occasions that inflection. But as the coast of *Africa* is more irregular, the winds also are found to be more different in their direction. To the north of *C. Verde*, as the coast stretches nearly *south* and *north*, the wind, being drawn towards it a little, blows from the NW. But beyond that, the coast bends more eastward to *C. Palmas;* from which it runs E or NE all along the coast of Guinea, the wind shifting gradually more and more to the west, still pointing in upon the coast. And as there is nothing to oppose the current of air, which comes from the south, along the coast of *Angola*, it stretches forward till it comes within the influence of the coast of *Guinea*, and is there drawn in towards the shore in a SW direction. But as it is only the lower regions of the coast of *Guinea* which are so much warmed, the high mountains within continuing cold; the northerly wind coming from these meeting and opposing the southerly winds in the higher regions of the air, by their mutual conflicts occasion those incessant rains and tremenduous thunder so remarkable along the whole of this uncomfortable coast.

It has been often observed by mariners, that there is a track of sea to the west of *Guinea* from five to ten degrees of north latitude, in which the trade-wind blows with less steadiness than in any other part of that ocean, being almost constantly troubled with calms and tornadoes; the cause of which the reader will perceive by inspecting the map; as he will easily see that the winds are drawn from this quarter almost in every direction; so that there can be here no constant wind; but being exhausted of its air, it must become lighter than the circumjacent parts, and must then be supplied

plied from either side, as chance or occasional circumstances may direct, which occasions those sudden flurries and tornadoes here observed.

Before we take our leave of this subject, it is necessary to observe, that in the Bay of *Panama*, the winds between *September* and *March* are easterly; but from *March* till *September* they blow chiefly from the SSW; that is, during the winter months, while the sun is far from them, the winds are off shore; and during the summer months, the land being heated to a considerable degree, they are drawn towards the shore as usual. It is remarkable, however, that this is the only part on the west of a large continent where the wind shifts regularly at different seasons; which seems to be occasioned by the great height of the *Isthmus* of *Darien*, and the Terra Firma to the east of it, and the nearness of these to the sea, in comparison of the mountains near *Benin* on the similarly situated coast of Africa; which is greatly assisted by the deepness of the bay, which, by bending so much to the eastward from *C. Lorenzo*, is in a great measure screened from the force of the south winds, which allows the winter breeze to extend itself upon the bay with more facility. We ought here also to remark, that along the coast of *Mexico*, between *C Pelanco* and *Guatimala*, there are land winds which blow in the months of *May*, *June*, and *July*, called by the Spaniards *Popogaios*. They greatly resemble the *Summasenta* winds in the *Bay of Campeachy*, as they blow both night and day a moderate breeze without intermission, sometimes three or four days or a week together. But as these blow from the land in *summer* only, whereas the *Summasenta's* blow only in winter, they must be occasioned by a different cause; which seems to be this: As the continent which divide the *south sea* from the *Bay of Mexico* and *Gulf of Hunduras*, is but of very small breadth, and in many places very high ground, the heat which it receives from the sun in *summer* is not so great as on the similar coast of Africa: and as the trade-wind coming from the *great Atlantic* ocean sweeps along the eastern part of the *American* coast from *C. St Augustine* to the *Bay of Honduras* with very great violence at that season, the small heat of this narrow continent, is not sufficient to stop it entirely during that season; so that at some times it blows for a short time quite across it, and occasions those winds called *Popogaios*.

Besides these more general winds, there are likewise some particular winds which are only felt in particular places at certain times, whose effects are so singular as to merit attention; some of which we shall here take notice of. In the *Gulf of Persia*, particularly at *Ormuz*, during the months of *June* and *July*, there sometimes blows from the west, for a day or two together, a hot suffocating fiery wind, which scorches up and destroys any animal that may be exposed to it; for which reason, almost every body leave their habitations at *Ormuz* during these two months, and retire to the mountoins near *Schiras* in *Persia*, where they enjoy a more comfortable climate. To explain the cause of which, it is necessary to observe, that along all the coasts of *Asia*, to the north of the *Indian ocean*, the diurnal sea and land breezes take place, as in every part of the torrid zone; by means of which, the monsoons are not felt close in upon the shores. But as the monsoon continues to blow regularly at a small distance from shore, so in all probability it continues its course without interruption at a small distance above the surface of the earth. Now when the monsoon is in its greatest vigour, its influence will sometimes descend even as low as the surface of the earth, and, interrupting the course of the *breezes*, hurry along with it these warm vapours, which ought to have ascended upwards, and produced the salutary sea-breeze; and as the earth is thus deprived of the refreshing influence and moisture of the sea-breeze, the air, by the strong reverberation of the sun-beams from such dry and sandy countries as *Arabia*, must soon be heated to an amazing degree, and produce these hot and suffocating winds. It is also remarkable, that these hot winds are more often experienced near headlands, where the sea-breezes are weakest, which seems to confirm this hypothesis. Winds similar to these in kind, though not in degree, are felt upon the coast of *Coromandel* during the months of *June*, *July*, and *August*, while the *west* monsoon reigns; and on the *Malabar* coast they are likewise felt in the months of *December* and *January*, while the *east* monsoon reigns; but these are much less powerful than either of the others. As these hot winds always come from the land, they are known upon these coasts by the name of *Terreno's*.

It has likewise been observed, that on the coast of *Africa* to the north of *C. Verde*, during the months of *December*, *January*, and *February*, there sometimes blows, for a day or two together, an *easterly* wind, so very intensely cold as to be almost as destructive as the warm winds at *Ormuz*. We have already in some measure explained the cause of this phenomenon. During these months, when the sun is far from them, his influence is less felt than at other seasons, and the northerly wind upon the coast is of course weakened, insomuch that the cold produced by the mountains in the heart of the country being now in its greatest degree of force, bursts its usual confinement for a time, spreading to the west with great violence, and producing those uncommon effects already mentioned. Those who sail on these coasts, distinguish this particular wind by the name of *Hermatan*.

These are the principal winds, whether constant or periodical, that take place within the *tropics*; and thus simple are their causes.

The succession of sea and land breezes renders the Torrid Zone not only habitable but comfortable. Besides, as these currents of cold air, rushing from each side of the globe, and carrying along with them vast quantities of aqueous vapours which they collect from the surface of the earth in their course, meet and oppose one another at that part of the atmosphere where the influence of the sun is greatest at the time, the water is there forced from the clouds in such prodigious quantities, as to produce a diversity of seasons in the Torrid Zone, something similar to what is experienced in more temperate climates; with this difference however, that whereas, in temperate climates, the warmest and most comfortable season is when the sun approaches nearest perpendicular to them, in these warmer climates the heavy rains which fall upon them at that season moderates the heat, and prevents the sun from having such an effect as at other times; so that their coldest and most inconstant weather, which they call *winter*, is at that season, when, without this cause, they would be exposed to the sun's most powerful influence.

We shall only take notice of one other instance of the happy effects produced on our globe, by the laws of nature with respect to winds. We have seen, that in the great *Atlantic* and *Pacific* oceans, the trade-wind blows constantly from the *easterly* points throughout the whole year, so that

ships

ſhips ſail from *eaſt* to *weſt* within the tropics with the utmoſt facility; but it is abſolutely impoſſible in theſe ſeas to ſail from *weſt* to *eaſt*, as the wind would be conſtantly againſt them, ſo that ſhips bound for any port to the *eaſtward* in theſe regions, muſt ſtand to the *north* or *ſouth* till they are beyond the limits of the *trade-winds*, where they meet with *variable breezes*, by the help of which they ſail to the *eaſtward*. But if the ſame conſtant *trade-wind* had taken place in the northern part of the *Indian Ocean*, it would have been impoſſible to have ſailed to the *eaſtward* at all; becauſe the continent of Aſia would have prevented the ſhips from ſailing far enough north to find the variable winds. But here, as in almoſt every caſe in which the operations of nature are concerned, we find, that what produceth the diſeaſe, at the ſame time furniſheth a remedy: for that very continent which would have ſtood in our way going northward, draws the wind towards itſelf at one ſeaſon, which makes that courſe of navigation unneceſſary, the ſhifting of the *monſoons* ſupplying a nearer and more commodious courſe. Thus we ſee, that where-ever the ſea is open to the ſouth or north, near the *tropics*, ſo as that ſhips are at freedom to reach the *variable winds*, the *trade-wind* conſtantly blows in one direction; but where-ever there is any extent of continent within the verge of the *Torrid Zone*, ſo as that they could not be at liberty to reach the variable winds, there the courſe of the trade-wind is altered, being drawn towards it in ſummer, and from it in winter, forming that ſhifting wind called *monſoons*. From which we may naturally infer, that as there are no *monſoons* in the *Pacific* or *Atlantic*, or in the weſtern part of the *Indian* ocean, to the ſouth of the *line*, there are no extenſive continents near the tropics in either of theſe places.

PNEUMATOCELE. See MEDICINE and SURGERY.

PNEUMONICS, in pharmacy, medicines proper in diſeaſes of the lungs, in which reſpiration is affected.

PO, a great river of Italy, riſing in the Alps, and running firſt eaſt, ſoon after turns directly north, through Piedmont, where it receives the Doria; then paſſing north eaſt, it diſcharges itſelf by ſeveral channels into the gulph of Venice.

POA, in botany, a genus of the triandria digynia claſs. The calix has two valves including ſeveral flowers; the ſpike is oval, with pointed valves. There are 20 ſpecies, twelve of them natives of Britain.

POCHARD, in ornithology. See ANAS.

PODAGRA, in medicine, the gout in the feet. See MEDICINE.

PODALIA, a province of Poland, bounded by Volhinia, and the Ruſſian Ukrain, on the north and north-eaſt; by Budziac Tartary, on the ſouth-eaſt; by the river Nieſter, which ſeparates it from Beſſarabia and Moldavia, on the ſouth-weſt; and by the province of Red-Ruſſia, on the north-weſt.

PODENSTIEN, a town of Germany, in the circle of Franconia: ſituated in E. long. 11° 35′, N. lat. 49° 50′.

PODEX, in anatomy. See ANUS.

PODOPHYLLUM, in botany, a genus of the polyandria monogynia claſs. The corolla has nine petals, and the calix three leaves; the capſule is oval and unilocular. There are two ſpecies, none of them natives of Britain.

POEM, a compoſition in verſe of a due length and meaſure.

Poems are generally denominated from the ſubject-matter, as the apobaterion, epibaterion, epinicion, epithalamium, genethliac, elegiac, ſatiric, epitaph, panegyric, lyric, paſtoral, &c. and others from the manner of narration, as epic, dramatic, &c. to which may be added odes, eclogues, and idylliums. To this head may alſo be referred ſeveral other compoſitions of a leſs ſerious kind, as the acroſtic, enigma, anagram, cento, echo, &c.

POET, the author of a poem. See POEM.

POETRY, the art of compoſing poems, or pieces in verſe; or, as defined by Voſſius, the art of repreſenting actions in metre.

Voſſius thinks that love was the firſt occaſion of poetry; which is not improbable, conſidering that this affection is coeval with mankind, is univerſal, and naturally productive of poetry. Yet it undoutedly owes its increaſe and progreſs to religion. Dacier indeed calls it the offspring of religion; and it is certain, in the earlieſt ages of the world, that it was uſual to ſing hymns to the honour of the gods upon ſolemn feſtivals. Du Bos thinks that poetry has been employed in all ages, even by the moſt unpoliſhed nations, to preſerve the memory of paſt events. Its principal aim is to flatter our ſenſes and imagination: for, according to Plato, it awakes the ſpiritual empire of the ſoul. Every kind of poetry charms us in proportion to its object, ſays Du Bos; and to be very affecting, it ought to be very exact. It is not the ſame with poetry as with other arts; for an ignorant perſon may judge of poetry by the impreſſion it makes on him: whence all men have a right to give their opinion concerning a piece of poetry; and this judgment ought to be founded on experience rather than on argumentation. Poetry is an art where every thing ſhould pleaſe. It is not enough to exhibit nature, which in certain places and circumſtances is rude and unpleaſant; but the poet muſt chuſe in her what is beautiful from what is not: whence a poet ought to chuſe, for the ſubject of his imitation, ſomething that is naturally affecting. There is a particular rhetoric for poetry, which conſiſts in diſcerning very preciſely what ought to be ſaid figuratively, and what to be ſpoken ſimply; and in knowing where ornament is required, and where not: yet the ſtyle ſhould be copious, and every ſpecies of writing in this art ſhould have a diction proper to itſelf. The qualifications, then, neceſſary for poetry, or thoſe which form a good poet, are ſeldom found united in one perſon: he muſt have an extraordinary genius, great natural gifts, a wit juſt, piercing, ſolid, and univerſal; an underſtanding clear and diſtinct; an imagination neat and pleaſant; an elevation of ſoul that depends not on art, or ſtudy, and which is purely a gift of heavan, and muſt be ſuſtained by a lively ſenſe and vivacity, a great judgment to conſider wiſely of things, and a vivacity to expreſs them with that grace and abundance which gives them beauty. In fine, to accompliſh a poet, is required a temperature of wit and fancy, of ſtrength and ſweetneſs, of penetration and delicacy; but, above all,

all, he muſt have a ſovereign eloquence, and a profound capacity. Theſe are the qualities that muſt concur together to form the genius of a poet, and ſuſtain his character.

POICTIERS, the capital of Poictou, in France, ſituated on an eminence, near the river Clain: E. long. 15′, N. lat. 46° 40′.

POICTOU, a territory of France, in the province of Orleanois, ſituated ſouth of the river Loire, being bounded by the provinces of Anjou and Britany on the north, by Touraine and Berry on the eaſt, by Santoign, Angoumois, and Aunis on the ſouth, and by the ocean on the weſt. It is one hundred and fifty miles long, and ſeventy broad.

POINCIANA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five leaves, and the corolla of five petals; the ſtamina are long. There are three ſpecies, all natives of India.

POINT, a term uſed in various arts.

POINT, *punctum*, in geometry, as defined by Euclid, is a quantity which has no parts, or which is indiviſible.

POINT, in grammar, a character uſed to mark the diviſions of diſcourſe.

POINTS, in heraldry, are the ſeveral different parts of an eſcutcheon, denoting the local poſitions of any figure. There are nine principal points in an eſcutcheon, as repreſented in Plate CXLV. fig. 2. where A ſhews the dexter chief; B, the preciſe middle chief; C, the ſiniſter chief; D, the honour-point; E, the feſs-point, called alſo the centre; F, the nombril-point, that is, the navel-point; G, the dexter baſe; I, the ſiniſter baſe; H, the preciſe middle baſe.

POISON, in medicine. See MEDICINE, p. 152.

POLAND, a large kingdom of Europe, ſituated between 16° and 34° eaſt longitude, and between 46° and 57° north latitude; bounded by Ruſſia on the north and eaſt; by Beſſarabia, Moldavia, Tranſilvania, and Hungary, on the ſouth; and by Pomerania, Brandenburg, and Sileſia, on the weſt; being almoſt ſquare, and ſeven hundred miles over either way.

POLAR, in general, ſomething relating to the poles of the world, or poles of the artificial globes: thus we meet with polar circles, polar dial, polar projection, &c.

POLARITY, the quality of a thing conſidered as having poles; but chiefly uſed in ſpeaking of the magnet.

POLE, in aſtronomy, one of the extremities of the axis on which the ſphere revolves.

POLE, PERCH, or ROD, in ſurveying, is a meaſure containing fixteen feet and a half.

POLE, or POLAR STAR, is a ſtar of the ſecond magnitude, the laſt in the tail of urſa minor. See ASTRONOMY, p. 486.

POLE-CAT. See MUSTELA.

POLEMICAL, in matters of literature, an appellation given to books of controverſy, eſpecially thoſe in divinity.

POLEMONIUM, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of five ſegments; the ſtigma is trifid; and the capſule has three cells. The ſpecies are five, only one of which, *viz.* the cæruleum, or great valerian, is a native of Britain.

POLIANTHES, in botany, a genus of the hexandria monogynia claſs. The corolla is bell-ſhaped; and the filaments are inſerted into the faux. There is but one ſpecies.

POLICY, or POLITY, in matters of government. See POLITY.

For policies of aſſurance, or inſurance on ſhips, houſes, lives, &c. ſee INSURANCE.

POLISHER, or BURNISHER, among mechanics, an inſtrument for poliſhing and burniſhing things proper to take a poliſh. The gilders uſe an iron-poliſher to prepare their metals before gilding, and the blood-ſtone to give them the bright poliſh after gilding.

POLISHING, in general, the operation of giving a gloſs or luſtre to certain ſubſtances, as metals, glaſs, marble, &c. See METAL, GLASS, &c.

POLITICS, the firſt part of œconomy, conſiſting in the well governing and regulating the affairs of a ſtate, for the maintenance of the public ſafety, order, tranquillity, and morals.

POLITY, or POLICY, denotes the peculiar form and conſtitution of the government of any ſtate or nation; or, the laws, orders, and regulations, relating thereto.

Polity differs only from politics, as the theory from the practice of any art.

POLL, a word uſed in ancient writings for the head: hence to poll, is either to vote or to enter down the names of thoſe perſons who give in their votes at an election.

POLLACK, in ichthyology. See GADUS.

POLLEX, in anatomy, denotes either the thumb or great toe, according as either manus or pedis is added to it. See ANATOMY.

POLLUX, in aſtronomy, a fixed ſtar of the ſecond magnitude in the conſtellation gemini, or the twins. See ASTRONOMY, p. 487.

POLOCZK, the capital of the palatinate of the ſame name, in the duchy of Lithuania, in Poland: E. long. 29°, N. lat. 56° 30′.

POLYACANTHA, in botany. See CARDUUS.

POLYADELPHIA, in botany. See BOTANY, p. 635.

POLYANDRIA, in botany. See BOTANY, p. 635.

POLYANTHUS, in botany. See PRIMULA.

POLYCHREST, in pharmacy, ſignifies a medicine that ſerves for many uſes, or that cures many diſeaſes.

Sal POLYCHREST, a compound ſalt made of equal parts of ſalt-petre and ſulphur, laid on a red-hot crucible.

POLYCNEMUM, in botany, a genus of the triandria monogynia claſs. The calix conſiſts of three leaves, and the corolla of five petals; and it has but one round ſeed. There is but one ſpecies, a native of Germany.

POLYGALA, in botany, a genus of the diadelphia octandria claſs. The calix conſiſts of five leaves; and the pod is cordated, and has two cells. There are 24 ſpecies, only one of them, *viz.* the vulgaris, or milk-wort, a native of Britain.

POLYGAMIA, in botany. See BOTANY, p. 635.

POLYGAMY, a plurality of wives or huſbands, in the poſſeſſion of one man or woman, at the ſame time.

Many arguments have been offered to prove the unlawfulneſs of polygamy; one of the principal of which is, that the males and females brought into the world are nearly on a balance; only abating for a ſmall exceſs on the ſide of the males to make up for the extraordinary expence thereof in war and at ſea: whence it evidently follows, that nature only intends one wife, or one huſband, for the ſame perſon; ſince if they have more, ſome muſt go without any at all. Hence it is juſtly concluded, that

that the Christian law, which prohibits polygamy, is more agreeable to the law of nature than the Mahometan, and, we may add, than the Jewish law, by which polygamy was tolerated.

POLYGLOTT, among divines and critics, chiefly denotes a bible printed in several languages. See BIBLE.

POLYGON, in geometry, a figure with many sides, or whose perimeter consists of more than four sides at least: such are the pentagon, hexagon, heptagon, *&c.*

POLYGONATUM, in botany. See CONVALLARIA.

POLYGONUM, in botany, a genus of the octandria trigynia class. It has no calix; the corolla has five segments; and there is but one angular seed. The species are 27, eleven of them natives of Britain.

POLYGYNIA, among botanists. See BOTANY, p. 635.

POLYHEDRON, in geometry, denotes a body or solid comprehended under many sides or planes.

POLYHEDRON, in optics, is a multiplying glass or lens, consisting of several plane surfaces disposed into a convex form. See OPTICS.

POLYMATHY, denotes the knowledge of many arts and sciences.

POLYMNIA, in botany, a genus of the syngenesia polygamia necessaria class. The receptacle is paleaceous; it has no pappus; and the calix consists of ten leaves. There are two species, both natives of America.

POLYPUS, in zoology, a species of the hydra, which, although cut in a thousand pieces, and in every direction, still exists, and each section becomes a compleat animal.

POLYPETALOUS, among botanists, an epithet applied to such flowers as consist of several petals, or flower-leaves.

POLYPODIUM, in botany, a genus belonging to the cryptogamia filices class. The fructifications are disposed in round spots on the margin of the leaf. There are 65 species, 14 of them natives of Britain.

POLYPREMUM, in botany, a genus of the tetrandria monogynia class. The calix consists of four leaves, and the corolla, which is rotated, of four segments; the capsule is compressed, and bilocular.

POLYPUS *of the heart.* See MEDICINE, p. 158.

POLYSYLLABLE, in grammar, a word consisting of more syllables than three; for when a word consists of one, two, or three syllables, it is called a monosyllable, dissyllable, and trisyllable.

POLYTHEISM, in matters of religion, the doctrine or belief of a plurality of gods.

POLYTRICHUM, in botany, a genus of the cryptogamia musci class. The anthera is operculated, and the calyptra hairy. There are three species, one of them, *viz.* the commune, or great golden maidenhair, a native of Britain.

POMEGRANATE. See PUNICA.

POMERANIA, a province of Upper Saxony, in the north of Germany; bounded by the Baltic-sea, on the north; by Poland, on the east; by another part of Poland, and Brandenburg, on the south; and by the duchy of Mecklenburg, on the west.

POMME', or POMMETTE', in heraldry, is a cross with one or more balls or knobs at each of the ends.

POMMEL, or PUMMEL, in the menage, a piece of brass, or other matter, at the top and in the middle of the saddle-bow.

POND-WEED, in botany. See POTAMOGETON.

PONDICHERRY, a town of India, on the Coromandel-coast, sixty miles south of Fort St. George.

PONTEDERIA, in botany, a genus of the hexandria monogynia class. The corolla consists of one bilabiated petal cut into six segments; and the capsule has three cells. There are three species, none of them natives of Britain.

PONTEFRACT, a borough-town, eighteen miles south-west of York. It sends two members to parliament.

PONTIFICATE, is used for the state or dignity of a pontif, or high-priest; but more particularly, in modern writers, for the reign of a pope.

PONTON, or PONTOON, in war, denotes a little floating bridge made of boats and planks.

PONTUS, the ancient name of the countries situated on the south side of the Euxine sea, now a part of Asiatic Turky.

POOL, in geography, a borough and port town of Dorsetshire, situated on a bay of the English channel, twenty miles east of Dorchester. It sends two members to parliament.

POOLOWAY, one of the Banda or nutmeg-islands in the Indian ocean: E. long. 128°, S. lat. 3° 30′.

POOP, the stern of a ship, or the highest, uppermost, and hinder part of the ship's hull.

POOR, in law, an appellation given to all persons who are in so low and mean a condition, as that they either are, or may become a burden to a parish.

POPAYAN, a province of South America, bounded by Terra-Firma, on the north; by New Granada, on the east; by Peru, on the south; and by the pacific ocean, on the west; situated between 75 and 80 degrees west longitude, and between the equator and 5 degrees of north latitude, being four hundred miles long, and about three hundred broad.

POPE, the sovereign pontiff, or supreme head of the Romish church. The appellation of pope was anciently given to all Christian bishops; but about the latter end of the eleventh century, in the pontificate of Gregory VII. it was usurped by the bishop of Rome, whose peculiar title it has ever since continued.

POPE'S TERRITORIES, in Italy, are bounded by the Venetian territories, on the north; by the gulph of Venice, on the north-east; by Naples, on the south-east; by the Tuscan sea, on the south-west; and by the duchy of Tuscany, on the north-west, almost encompassing that duchy on the land side; being about two hundred and twenty miles long, and from twenty to one hundred and forty in breadth.

POPE, in ornithology. See ALCA.

POPLAR, in botany. See POPULUS.

POPLITÆUS, in anatomy. See ANATOMY, p. 208.

POPPY, in botany. See PAPAVER.

POPULAR, something that relates to the common people.

POPULUS, the poplar, in botany, a genus of the diœcia octandria class. The corolla of the male is turbinated, oblique, and entire; the stigma of the female is quadrifid; and the capsule has two cells, containing many pappous seeds. There are five species, three of them natives of Britain, *viz.* the alba, or white poplar; the nigra, or black poplar; and the tremula, or trembling poplar, or asp.

PORCELAIN, a fine sort of earthen-ware, chiefly manufactured in China, and thence called china-ware. The most just idea we can form of the porcelain, or china-ware,

ware, is, that it is an half vitrified ſubſtance, or manufacture, in a middle ſtate between the common baked earthen ware of our vulgar manufactures, and true glaſs. This is the eſſential and diſtinctive character of porcelain; and it is only by conſidering it in this light, that we are to hope of arriving at the perfect art of imitating it in Europe. This attempt is to be made on theſe principles in two different manners The one by finding ſome appropriated matter, on which fire acts with more than ordinary ſtrength, in the time of its paſſing from the common baked ſtate of earthen ware into that of glaſs. The other is to compoſe a paſte of two ſubſtances, reduced to a powder; the one of which ſhall be of force to reſiſt a very violent fire, ſo as not to become vitrified in it; and the other a matter very eaſily vitrifiable. In the firſt caſe, the matter is to be taken out of the fire at the time when it is imperfectly vitrified; and in the other, the compound maſs is to remain in the furnace, till the one ſubſtance which is the more eaſily vitrifiable is truly vitrified; and being then taken out, the whole will be what porcelain is, a ſubſtance in part vitrified, but not wholly ſo. The firſt method is that by which the European porcelain has been generally made, which though it may be very beautiful, yet it is always eaſy to diſtinguiſh even the fineſt of it from the china-ware: and the nature of the two ſubſtances appears evidently different: theſe owing all their beauty to their near approach to vitrification, are made to endure a long and violent fire, and are taken from it at a time when a little longer continuance ſhould have made them perfect glaſs; on the contrary, the china ware being made of a paſte, part of which is made of a ſubſtance in itſelf ſcarce poſſible to be vitrified, bears the fire in a yet much more intenſe degree than ours, and is in no danger of running wholly into glaſs from it.

The two ſubſtances uſed by the Chineſe, are well known by the names of petunſe and kaolin; and on examining theſe, it appears very evident, that we have in Europe the very ſame ſubſtances, or at leaſt ſubſtances of the very ſame nature, capable of being wrought into porcelain equally beautiful and fine.

Porcelain-shell. See Cypræa.

PORCUPINE, in zoology. See Histrix.

PORE, in anatomy, a little interſtice or ſpace between the parts of the ſkin, ſerving for perſpiration.

PORELLA, in botany, a genus of moſſes, the anthera of which is multilocular and foraminoſe. See Moss.

PORIA, a genus of funguſes, growing horizontally; but having its under ſide not formed into lamellæ, but full of little holes or pores.

There are a great many ſpecies of poria, among which is the agaric of the ſhops. See Agaric, and Styptic.

PORPESSE, in ichthyology. See Delphinus.

PORPHYRY, in natural hiſtory, a kind of ſtone of a plain uniform maſs, ſpotted with ſeparate concretions, of great hardneſs, giving fire with ſteel, not fermenting with acids, and very ſlowly and difficultly calcining in a ſtrong fire.

Porphyry is of ſeveral ſorts; as, 1. The porphyry of the ancients, which is a moſt elegant maſs of an extremely firm and compact ſtructure, remarkably heavy, and of a fine ſtrong purple, variegated more or leſs with pale, red, and white: its purple is of all degrees, from the claret-colour to that of the violet; and its variegations are rarely diſpoſed in veins, but ſpots, ſometimes very ſmall, and at others running into large blotches. It is leſs fine than many of the ordinary marbles; but it it excells them all in hardneſs, and is capable of a moſt elegant poliſh. It is ſtill found in immenſe ſtrata in Egypt. 2. The hard red lead-coloured porphyry, variegated with black, white, green. This is a moſt beautiful and valuable ſubſtance. It has the hardneſs, and all the other characters of the oriental porphyry; and even greatly excells it in brightneſs, and in the beauty and variegation of its colours. It is found in great plenty in the iſland of Minorca; and is extremely worth importing, for it is greatly ſuperior to all the Italian marbles. 3. The hard pale-red porphyry, variegated with black, white, and green. This is of a pale fleſh-colour; often approaching to white. It is variegated in blotches from half an inch to an inch broad. It takes a high poliſh, and emulates all the qualities of the oriental porphyry. It is found in immenſe ſtrata in Arabia Petræa, and in the Upper Egypt: and in ſeparate nodules in Germany, England, and Ireland.

Porphyry-shell. See Murex

PORRUM, in botany, See Allium.

PORT-GREVE, or Port-grave, was formerly the principal magiſtrate of maritime towns. The chief magiſtrate of London was anciently called by this name, till Richard I. cauſed the city to be governed by two baliffs; ſoon after which king John granted the city a mayor.

Port-l'orient, in geography, a fortreſs and port-town of Britany in France, at the mouth of the river Blavet: W. long. 3° 15′, N. lat. 47° 42′.

Port-louis, a port-town of Britany in France, ſituated in the bay of Biſcay: W. long 3° 6′, N. lat. 47° 42′.

Port-mahon, a port-town of the iſland of Minorca, ſituated on a fine bay at the eaſt end of the iſland, in E. long. 4° 6′, N. lat. 39° 50.

Port-royal, the name of two monaſteries of Ciſtercian nuns, in the dioceſe of Paris; the one near Chevreuſe, at the diſtance of five leagues from Paris, called Port-Royal of the fields; and the other in Paris, in the ſuburbs of St James.

The nuns of the former of theſe monaſteries, proving refractory, were diſperſed; when many eccleſiaſtics, and others who were of the ſame ſentiments as theſe religious, retired to Port Royal, took apartments there, and printed many books: hence the name of Port-Royaliſts was given to all of their party, and their books were called books of Port-Royal: from hence we ſay the writers of Port Royal, Meſſieurs de Port-Royal, and the tranſlations and grammars of Port-Royal.

Port-royal, in geography. a port-town, ſituated in the extremity of a long point of land, in the ſouth-eaſt part of the iſland of Jamaica: W. long. 77°, N. lat. 17° 30′.

Port-royal, an iſland on the coaſt of South-Carolina, which, with the neighbouring continent, forms one of the moſt commodious harbours in the Britiſh plantations: W. long. 80°, N. lat. 31° 45.

PORTA, or vena porta, in anatomy. See Anatomy, p. 244

PORTATE, or a Cross portate, in heraldry, a croſs which does not ſtand upright, as croſſes generally do, but lies acroſs the eſcutcheon in bend, as if it were carried

carried on a man's ſhoulders. See Plate CXLV. fig. 2.

PORTRENTRU, a city of Switzerland, in the biſhoprick of Baſil: E. long. 7°, N. lat. 47° 30′.

PORTER, a kind of malt-liquor, which differs from ale and pale-beer in its being made with high-dried malt. See BREWING.

PORTICO, in architecture, a kind of gallery on the ground, ſupported by columns, where people walk under covert.

PORTLAND, a peninſula in Dorſetſhire, ſituated in the Engliſh channel, ten miles ſouth of Dorcheſter, famous for producing the beſt free-ſtone.

PORTO-BELLO, a port-town of America, ſituated on the narroweſt part of the iſthmus of Darien: W. long. 82°, N. lat. 10°.

PORTO-RICO, an iſland in the American ocean, one hundred and twenty miles long, and ſixty broad, which produces ſugar, rum, and ginger: ſituated between 64° and 68° of W. long. and in 8° of N. lat. It is ſubject to Spain. The capital is alſo called Porto Rico, and St John's city.

PORTO SANTO, the leaſt of the Madeira iſlands, eighteen miles in circumference: W long. 16°, N. lat. 33°.

PORTRAIT, in painting, the repreſentation of a perſon, and eſpecially of a face, done from the life.

In this ſenſe we uſe the term portrait-painting, in contradiſtinction to hiſtory-painting, where a reſemblance of perſon is uſually diſregarded. Portraits, when as large as the life, are uſually painted in oil-colours; ſometimes they are painted in miniature with water-colours, crayons, paſtils, *&c*

PORTSMOUTH, a borough and port town of Hampſhire, ſituated on a fine bay of the Engliſh channel; it has one of the moſt ſecure, capacious, and beſt fortified harbours in England: W. long 1° 6′, N. lat 50° 48′. It ſends two members to parliament

PORTUGAL, the moſt weſterly kingdom in Europe: it is about three hundred miles long, and one hundred broad; and is ſituated between 7° and 10° of W long. and between 37° and 42° of N. lat. being bounded by Spain on the north and eaſt; and by the Atlantic ocean on the ſouth and weſt. This country is neither ſo hot nor ſo fruitful as Spain; it however produces plenty of grapes, olives, oranges and lemons

PORTUGALLICA TERRA, *earth of Portugal*, the name of a fine aſtringent bole, dug in great plenty in the northern parts of Portugal, and eſteemed a remedy againſt poiſons and venomous bites, and malignant fevers.

PORTULACA, in botany, a genus of the dodecandria monogynia claſs. The corolla conſiſts of five petals, and the calix of two ſegments. There are ſix ſpecies, none of them natives of Britain.

POSE′, in heraldry, denotes a lion, horſe, or other beaſt ſtanding ſtill, with all his four feet on the ground.

POSITIVE, a term of relation, oppoſed to negative. It is alſo uſed in oppoſition to relative or arbitrary: thus we ſay, beauty is no poſitive thing, but depends on the different taſtes of people.

POSITIVE DEGREE, in grammar, is the adjective in its ſimple ſignification, without any compariſon. See GRAMMAR.

POSSE COMITATUS, in law, ſignifies the power of the county, or the aid and aſſiſtance of all the knights, gentlemen, yeomen, labourers, ſervants, apprentices, *&c.* and all others within the county that are above the age of fifteen, except women, eccleſiaſtical perſons, and ſuch as are decrepit and infirm.

This poſſe comitatus is to be raiſed where a riot is committed, a poſſeſſion kept upon a forcible entry, or any force of reſcue uſed, contrary to the king's writ, or in oppoſition to the execution of juſtice; and it is the duty of all ſheriffs to aſſiſt juſtices of the peace in the ſuppreſſion of riots, *&c.* and to raiſe the poſſe comitatus, or to charge any number of men for that purpoſe.

POSSESSION, in Scots law. See LAW, Tit. viii. 11.

POSSESSIVE, in grammar, a term applied to pronouns which denote the enjoyment or poſſeſſion of any thing either in particular or in common: as *meus*, mine; and *tuus*, thine.

POSSESSORY *action*, in Scots law. See LAW, Tit. xxx. 18.

POSSIBILITY, in law, is defined to be any thing that is altogether uncertain, or what may or may not be.

POSSIBILITY alſo denotes a non-repugnance to exiſting, in any thing that does not any way exiſt.

POSSIBLE, is ſometimes oppoſed to real exiſtence; and is underſtood of a thing which, though it does not actually exiſt, yet may exiſt; as a new ſtar.

POST, a courier or letter-carrier, or one who frequently changes horſes, poſted or placed on the road, for quicker diſpatch. The word is alſo applied to the houſes where ſuch a perſon takes up and lays down his charge.

In England, poſts were firſt eſtabliſhed by act of parliament in the twelfth year of the reign of Charles II. which enabled the king to ſettle a poſt-office, and appoint a governor.

Penny-POST, a poſt eſtabliſhed for the benefit of London and the adjacent parts, by which any letter or parcel not exceeding ſixteen ounces weight, is ſpeedily conveyed to and from all parts within ten miles of London.

POSTDAM, or POTSDAM, a town of Germany in the marquiſate of Brandenburg, ten miles ſouth-weſt of Berlin.

POSTHUMOUS, a child born after the death of his father, or taken out of the body of a dead mother; from whence it is frequently applied to the works of an author not publiſhed till after his deceaſe.

POSTING, among merchants, the putting an account forward from one book to another, particularly from the journal or waſte-book to the ledger. See BOOK-KEEPING.

POSTLIMINIUM, among the Romans, the return of one who had gone to ſojourn elſewhere, or had been baniſhed or taken by an enemy to his own country and ſtate.

POSTULATE, in mathematics, *&c* is deſcribed to be ſuch an eaſy and ſelf-evident ſuppoſition, as needs no explication or illuſtration to render it intelligible; as, that a right line may be drawn from one point to another.

POTAMOGETON, in botany, a genus of the tetrandria tetragynia claſs. It has no calix, nor ſtylus; but has four petals, and four ſeeds There are 12 ſpecies, 10 of them natives of Britain.

POTANCE, in heraldry, a croſs like that repreſented in Plate CXLV. fig. 4.

POT-

POT-ASH, the lixivious-ashes of certain vegetables, used in the making of glass, soap, *&c.*

The method of making pot-ash is directed by Dr Shaw, as follows. Burn a quantity of billet-wood to grey ashes; and taking several pounds of these ashes, boil them in water, so as to make a very strong lixivium, or lye. Let this lye be strained through a coarse linen cloth, to keep out any black parts of the half-burnt wood, that might happen to remain in the ashes: then evaporate this strained lye in an iron-pan over a quick fire almost to driness: then taking out the matter remaining at the bottom, and putting it into an iron-crucible, set it in a strong fire till the matter is melted, and then immediately pour it out upon an iron-plate, where it soon cools, and appears in the form of a solid lump of pot-ash. Much after this manner is pot-ash made in the large way of business, for the service of the soap-boiler, glass-maker, fuller, *&c.* but according to the difference of the wood or combustible matter employed, with the manner of turning it, and conducting the process, different kinds of pot-ash are prepared.

POTATOE, in botany. See CONVOLVULUS, of which it is a species.

POTENT, or POTENCE, in heraldry, a term for a kind of a cross, whose ends all terminate like the head of a crutch. It is otherwise called the Jerusalem cross, and is represented in Plate CXLV. fig. 5.

POTENTIA, POWER, that whereby a thing is capable either of acting, or being acted upon.

POTENTIAL, in the schools, is used to denote and distinguish a kind of qualities, which are supposed to exist in the body in potentia only, by which they are capable in some manner of affecting and impressing on us the ideas of such qualities, though not actually inherent in themselves; in which sense we say, potential heat, potential cold.

POTENTIAL, in medicine. Cauteries are distinguished into actual and potential. See CAUTERY.

POTENTIAL, in grammar, an epithet applied to one of the moods of verbs. The potential is the same in form with the subjunctive. See GRAMMAR.

POTENTILLA, in botany, a genus of the icosandria polygynia class. The calix consists of ten segments, and the corolla of five petals; the seeds are round, naked, and fixed to the receptacle. There are 27 species, 8 of them natives of Britain.

This plant is said to possess in a great measure the virtues of the peruvian bark.

POTERIUM, in botany, a genus of the monœcia polyandria class. The calix of the male consists of five segments, that of the male has but one entire rough leaf. Neither of them have any corolla; the stamina of the male are from five to ten; and the styli of the female are from two to five; and the seed is single and oval. There are three species, one of which, *viz.* the sanguisorba, or burnet, is a native of Britain.

POTHOS, in botany a genus of the gynandria polyandria class. The spatha and spadix are roundish; it has no calix; the corolla has four petals; and the berry contains many seeds. There are seven species, none of them natives of Britain.

POTION, a liquid medicine, consisting of as much as can be drank at one draught.

POTOSI, a city of Peru in South America, situated at the bottom of a mountain of that name, in which is the richest silver-mine ever discovered: W. long. 67°, S. lat. 22°.

POTTERY, the manufacture of earthen ware, or the art of making earthen vessels.

The wheel and lathe are the chief, and almost the only instruments used in pottery; the first for large works, and the last for small. The potter's wheel consists principally in the nut; which is a beam or axis, whose foot or pivot plays perpendicularly on the free-stone sole or bottom. From the four corners of this beam, which does not exceed two feet in height, arise four iron-bars, called the spokes of the wheel; which forming diagonal lines with the beam, descend, and are fastened at bottom to the edges of a strong wooden circle, four feet in diameter, perfectly like the felloes of a coach-wheel, except that it has neither axis nor radii, and is only joined to the beam which serves it as an axis by the iron-bars. The top of the nut is flat, of a circular figure, and a foot in diameter; and on this is laid the clay which is to be turned and fashioned. The wheel, thus disposed, is encompassed with four different pieces of wood fastened on a wooden frame. The hind-piece, which is that on which workman sits, is made a little inclining towards the wheel: on the fore-piece are placed the prepared earth: on the side-pieces he rests his feet; and these are made inclining, to give him more or less room. Having prepared the earth, the potter lays a round piece of it on the circular head of the nut; and sitting down turns the wheel with his feet, till it has got the proper velocity: then, wetting his hands with water, he presses his fist or his fingers-ends into the middle of the lump, and thus forms the cavity of the vessel, continuing to widen it from the middle; and thus turning the inside into form with one hand, while he proportions the outside with the other, the wheel constantly turning all the while, and he wetting his hands from time to time. When the vessel is too thick, he uses a flat piece of iron, somewhat sharp on the edge, to pare off what is redundant; and when it is finished, it is taken off from the circular head, by a wire passed underneath the vessel.

The potter's lathe is also a kind of wheel, but more simple and slight than the former. Its three chief members are an iron-beam or axis, three feet and a half high, and two feet and a half diameter, placed horizontally at the top of the beam, and serving to form the vessel upon; and another larger wooden wheel, all of a piece, three inches thick, and two or three feet broad, fastened to the same beam at the bottom, and parallel to the horizon. The beam or axis turns by a pivot at the bottom in an iron-stand. The workman gives the motion to the lathe with his feet, by pushing the great wheel alternately with each foot, still giving it a greater or lesser degree of motion, as his work requires. They work with the lathe, with the same instruments, and after the same manner as with the wheel. The mouldings are formed by holding a piece of wood or iron cut in the form of the moulding to the vessel, while the wheel is turning round; but the feet and handles are made by themselves, and set on with the hand; and if there be any sculpture in the work, it is usually done in wooden moulds, and stuck on piece by piece on the outside of the vessel.

POTTLE, an English measure containing two quarts.

POULTRY, all kinds of domeſtic birds brought up in yards, as cocks, hens, capons, ducks, turkeys, *&c.*

POUND, a ſtanding weight. See MONEY.

POUND alſo denotes a money of account; ſo called, becauſe the ancient pound of ſilver weighed a pound troy. See MONEY.

POUNDAGE, a ſubſidy of 12 d. in the pound granted to the crown on all goods and merchandizes exported or imported; and if by aliens, one penny more.

POURPRESTURE, in law, is a wrongful incloſure, or encroachment upon another perſon's property.

POURSUIVANT, or PURSUIVANT, in heraldry, the loweſt order of officers at arms.

The pourſuivants are properly attendants on the heralds, when they marſhal public ceremonies. Of theſe in England, there were formerly many, but at preſent there are only four, *viz.* blue-mantle, rouge-croſs, rouge-dragon, and portcullice. In Scotland, there is only one king at arms, who is ſtyled Lion; and has no leſs than ſix heralds, and as many purſuivants, and a great many meſſengers at arms, under him.

POURVEYANCE, or PURVEYANCE, in law, the providing corn, fuel, victual, *&c.* for the king's houſhold; and hence the officer who did ſo was termed pourveyor.

POWDER, in pharmacy, a dry medicine well broken, either in a mortar by grinding or by chemical operations.

POWER, the faculty of doing or ſuffering any thing.

Power therefore is two-fold, *viz.* conſidered as able to make, or able to receive any change; the former whereof may be called active power, and the latter paſſive power. See METAPHYSICS.

POWER, in mechanics. See MECHANICS.

POWER, in law, ſignifies, in general, a particular authority granted by any perſon to another to repreſent him, or act in his ſtead.

POWERS, in arithmetic and algebra, are nothing but the products ariſing from the continual multiplications of a number, or quantity, into itſelf. See ALGEBRA, p. 81. and ARITHMETIC, p. 420.

POX, or SMALL POX, in medicine. See MEDICINE, p. 75.

French POX. See MEDICINE, p. 133.

PRACTICE, in arithmetic. See ARITHMETIC, p. 393.

PRAGMATIC SANCTION, in the civil law, is defined by Hottoman to be a reſcript, or anſwer of the ſovereign, delivered by advice of his council, to ſome college, order, or body of people, upon conſulting him on ſome caſe of their community. The like anſwer given to any particular perſon, is called ſimply reſcript. The term pragmatic ſanction, is chiefly applied to a ſettlement of Charles VI. emperor of Germany, who, in the year 1722, having no ſons, ſettled his hereditary dominions on his eldeſt daughter, the archducheſs Maria Thereſa which was confirmed by the diet of the empire, and guaranteed by Great Britain, France, the States-general, and moſt of the powers in Europe.

PRÆCEPTIO HEREDITATIS, in Scots law. See LAW, Tit. xxvii. 33.

PRAGUE, the capital of Bohemia, ſituated on the river Mulda, in E. long. 14° 20′, N lat. 50°. This is a ſtrong fine city; and next to London, Paris, and Conſtantinople, the largeſt in Europe.

PRAMNION, in natural hiſtory, the name of a ſemi-pellucid gem.

This is a very ſingular ſtone, and of a very great concealed beauty: our lapidaries, when they meet with it, call it by the name of the black agate. It is of an extremely cloſe, compact, and firm texture, of a ſmooth and equal ſurface, and in ſhape very irregular; being ſometimes round, ſometimes oblong, and often flat; in ſize it ſeldom exceeds two inches. It appears, on a common inſpection, to be of a fine deep black; but held up againſt the ſun, or the light of a candle, it is an elegant red, clouded by a quantity of ſubtile black earth. We have it from the Eaſt-Indies.

PRASIUM, in botany, a genus of the didynamia gymnoſpermia claſs. The berries are four, each containing one ſeed. There are two ſpecies, none of them natives of Britain.

PRATIQUE, or PRATTIC, in commerce, a negotiation, or communication, of commerce, which a merchant veſſel obtains in the port it arrives in, and the countries it diſcovers; hence to obtain a partique, is to obtain a liberty to frequent a port, to go aſhore, to buy and ſell, *&c.*

PREAMBLE, in law, the beginning of an act of parliament, *&c.* which ſerves to open the intent of the act, and the miſchiefs intended to be remedied by it.

PREBEND, the maintenance a prebendary receives out of the eſtate of a cathedral or collegiate church.

PREBENDARY, any eccleſiaſtic who enjoys a prebend.

PRECARIUM, in Scots law. See LAW, Tit. xx. 9.

PRECEDENCE, a place of honour to which a perſon is entitled. This is either of courteſy or of right. The former is that which is due to age, eſtate, *&c.* which is regulated by cuſtom and civility; the latter is ſettled by authority, and, when broken in upon, gives an action at law.

PRECEDENT, in law, a caſe which has been determined, and which ſerves as a rule for all of the ſame nature.

PRECEPT, in law, a command in writing ſent by a chief juſtice, juſtice of the peace, *&c.* for bringing a perſon, record, or other matter, before him.

PRECEPT OF CLARE CONSTAT, in Scots law. See LAW, Tit. xxvii 28.

PRECEPT OF SEISIN, in Scots law. See LAW, Tit. x. 15.

PRECESSION, in aſtronomy. See ASTRONOMY, p. 562.

PRECIPITANT, in chemiſtry, is applied to any liquor, which, when poured on a ſolution, ſeparates what is diſſolved, and makes it precipitate, or fall to the bottom of the veſſel. See CHEMISTRY.

The term precipitant is alſo uſed, in medicine, to denote any remedy that moderates the heat of the blood, by ſeparating, as is ſuppoſed, any heterogeneous matter contained therein.

PRECIPITATE, in chemiſtry, a ſubſtance which, having been diſſolved in a proper menſtrum, is again ſeparated from its ſolvent, and thrown down to the bottom of the veſſel by pouring ſome other liquor upon it.

PRECIPITATION. See CHEMISTRY, p. 69, 107.

PRECOGNITION, in Scots law. See LAW, Tit. xxxiii.

PRECORDIA, in anatomy, a general name for the parts ſituated about the heart, in the fore-part of the thorax; as the diaphragm, pericardium, and even the heart itſelf, with the ſpleen, lungs, *&c.* See ANATOMY.

PREDECESSOR, properly ſignifies a perſon who has preceded or gone before another in the ſame office or employment; in which ſenſe, it is diſtinguiſhed from anceſtor.

PREDESTINATION, in general, signifies a decree of God, whereby, from all eternity, he ordained such a concatenation of causes as must produce every event by a kind of necessity.

In this sense, the Turks are great predestinarians; and on this account are much more daring in battle, and willingly encounter greater dangers than they would otherwise do. See MAHOMETANISM.

Predestination, among Christians, is used, in a more limited sense, for a judgment or decree of God, whereby he has resolved, from all eternity, to save a certain number of persons, from thence called elect; so that the rest of mankind being left in a state of impenitence, are said to be reprobated.

PREDICABLE among logicians, denotes a general quality which may be predicated or asserted of several things: thus animal is predicable of mankind, beasts, birds, fishes, *&c.* See LOGIC.

PREDICAMENT, among logicians. See LOGIC.

PREDICATE, in logic, that part of a proposition which affirms or denies something of the subject. See LOGIC.

PREENING, in natural history, the action of birds dressing their feathers, to enable them to glide the more readily through the air, *&c.*

For this purpose they have two peculiar glands on their rump, which secrete an unctious matter into a bag that is perforated, out of which the bird occasionally draws it with its bill.

PRE-EXISTENCE, the state of a thing actually in being before another.

PREFACE, something introductory to a book, to inform the reader of the design, method, *&c.* observed therein, and generally whatever is necessary to facilitate the understanding of a book.

PREFECT, in ancient Rome, one of the chief magistrates who governed in the absence of the kings, consuls, and emperors.

PREFECT *of the pretorium*, the leader of the pretorian bands destined for the emperor's guards, consisting, according to Dion, of 10,000 men, This officer, according to Suetonius, was instituted by Augustus, and usually taken from among the knights.

PREGNANCY, the state of a woman who has conceived, or is with child. See MIDWIFERY.

PREJUDICE does not mean a judgment merely as prior to another in respect of time, but as being passed before the things were duly considered and fully understood. Hence prejudice is sometimes called anticipation, and a preconceived opinion.

PRELATE, an ecclesiastic raised to some eminent and superior dignity in the church; as bishops, archbishops, patriarchs, *&c.*

PRELIMINARY, in general, denotes something to be examined and determined, before an affair can be treated of to the purpose.

PRELUDE, in music, is usually a flourish or irregular air, which a musician plays off-hand, to try if his instrument be in tune, and so lead him into the piece to be played.

PREMISSES, in logic, an appellation given to the two first propositions of a syllogism. See LOGIC.

PRENANTHES, in botany, a genus of the syngenesia polygamia æqualis class. The receptacle is naked; and the pappus is simple. There are seven species, only one of them, *viz.* the muralis, or ivy-leaved wild lettuce, is a native of Britain.

PREPOSITA NEGOTIIS DOMESTICIS, in Scots law. See LAW, Tit. vi. 18

PREPOSITION, in grammar. See GRAMMAR.

PREPUCE, in anatomy. See ANATOMY, p. 274.

PREROGATIVE *of the king*, that power which the king hath, not only over other persons, but over the ordinary course of the common law, in right of his crown.

Such as, that he may pardon a person condemned to die, that the king's person is subject to no man's suit, his possessions cannot be taken from him by any violence, his goods are subject to no tribute, nor distrainable, *&c.*

PRESAGE, in antiquity, denotes an augury, or sign of some future event; which was chiefly taken from the flight of birds, the entrails of victims, *&c.* See AUGURY, and ARUSPICES.

PRESBURG, the capital of Hungary, a large city on the north side of the Danube, fifty miles east of Vienna: E. long. 17° 30', N lat. 48° 20'.

PRESBYTA, in optics, a person whose eyes being flat, can see distant objects distinctly, but those near confusedly; which defect of sight got this appellation, because old people are naturally subject to it.

Spectacles, or convex glasses, are the only remedy for this defect.

PRESBYTER, in the primitive Christian church, an elder, and of the second order of ecclesiastics; the other two being bishops and deacons.

PRESBYTERIANS, protestants, so called from their maintaining that the government of the church appointed in the New Testament was by presbyteries; that is, by ministers and ruling elders, associated for its government and discipline.

The presbyterians affirm, that there is no order in the church as established by Christ and his apostles superior to that of presbyters; that all ministers, being ambassadors of Christ, are equal by their commission; and that elder or presbyter, and bishop, are the same in name and office: for which they alledge, *Acts* xx. 28, *&c.*

The only difference between them and the church of England, relates to discipline and church-government. Their highest assembly is a synod, which may be provincial, national, or œcumenical; and they allow of appeals from inferior to superior assemblies; according to *Acts* xv. 2, 6, 22, 23. The next assembly is composed of a number of ministers and elders, associated for governing the churches within certain bounds. This authority they found upon *Acts* xi. 30. *Acts* xv. 4, 6, *&c.* The lowest of their assemblies or presbyteries consists of the minister and elders of a congregation, who have power to cite before them any member, and to admonish, instruct, rebuke, and suspend him from the eucharist. They have also a deacon, whose office is to take care of the poor.

The ordination of their ministers is by prayer, fasting, and imposition of the hands of the presbytery. This is now the discipline of the church of Scotland.

PRESCIENCE, in theology, fore knowledge, or the knowledge which God has of events before they come to pass.

PRESCRIPTION, in Scots law. See LAW, Tit. xxvi. 1.

PRESENCE, a term of relation used in opposition to absence, and signifying the existence of a person in a certain place.

PRESENT TENSE, in grammar. See GRAMMAR

PRE-

PRESENTATION, in Scots law. See LAW, Tit. v. 7.

PRESS, in the mechanic arts, a machine of wood, or iron, serving to squeeze any body very close, generally by means of a screw. See MECHANICS.

PRESTER JOHN, or JEAN, an appellation given to the king of Abyssinia or Ethiopia.

This name is altogether unknown in Ethiopia, where he is called the grand Negus.

PRESTO, in the Italian musick, intimates to perform very quick, as *prestissimo* does extremely so.

PRESTON, a borough-town, twenty miles south of Lancaster, which sends two members to parliament.

PRESUMPTION, in Scots law. See LAW, Tit. xxxi. 18.

PRETERITE TENSE, in grammar. See GRAMMAR.

PRETEXT, a colour or motive, whether real or feigned, for doing something.

Toga PRETEXTA, among the ancient Romans, a long white gown, with a border of purple round the edges, and worn by children of quality till the age of puberty, *viz.* by the boys till seventeen, when they changed it for the toga virilis; and by the girls till marriage.

PRETOR, a magistrate among the ancient Romans, not unlike our lord chief justices, or lord chancellor, or both in one: as being vested with the power of distributing justice among the citizens. At first there was only one pretor; but afterwards another being created, the first or chief one had the title of pretor urbanus, or the city-pretor; the other was called peregrinus, as being judge in all matters relating to foreigners. But, besides these, there were afterwards created many provincial pretors; who were not only judges, but also assisted the consuls in the government of the provinces, and even were invested with the government of provinces themselves.

PRETORIAN GUARDS, in Roman antiquity, were the emperor's guards, who at length were increased to ten thousand: they had this denomination, according to some, from their being stationed at a place in the palace called prætorium: their commander was stiled præfectus prætorii. See PREFECT.

PRETORIUM, among the Romans, denoted the hall or court wherein the pretor lived, and wherein he administered justice.

PREVENTION *in Jurisdiction*, in Scots law. See LAW, Tit. ii. 5.

PRIAPISM, in medicine, a continual and painful erection of the penis.

PRIAPUS, in medicine, denotes the genital parts in men

It also denotes in antiquity, a fabulous deity, particularly adored at Lamsacus, the place of his birth, who was revered very much for the extraordinary size of his parts.

PRIEST, a person set apart for the performing of sacrifice and other offices of religion.

PRIEST, in the Christian church, is a person invested with holy orders: in virtue whereof he has a power to preach, pray, administer the sacraments, *&c.*

PRIMÆ VIÆ, among physicians, denote the whole alimentary duct; including the œsophagus, stomach, and intestines, with their appendages.

PRIMAGE, in commerce, a small duty at the water side, usually about twelve pence per tun, or six pence a bale, due to the master and mariners of a ship.

PRIMATE, in church polity, an archbishop, who is invested with a jurisdiction over other bishops.

PRIME, an appellation given to whatever is first in order, degree, or dignity, among several things of the same or like kind; thus we say the prime minister, prime cost, *&c.*

PRIMIPILUS, in antiquity, the centurion of the first cohort of a legion, who had charge of the Roman eagle.

PRIMITIÆ, the first fruits gathered of the earth, whereof the ancients made presents to the gods.

PRIMITIVE, in grammar, is a root or original word in a language, in contradistinction to derivative: thus, *God* is a primitive, *godly* a derivative, and *god-like* a compound.

PRIMULA, in botany, a genus of the pentandria monogynia class. The tube of the corolla is cylindrical, with an open mouth. There are eight species, three of them natives of Britain, *viz.* the vulgaris, or common primrose; the veris, or cows-lips; and the farinosa, or birds-eye.

PRINCE, in polity, a person invested with the supreme command of a state, independent of any other.

Prince also denotes a person who is a sovereign in his own territories, yet holds of some other as his superior; such are the princes of Germany.

PRINCIPAL, the chief and most necessary part of a thing.

PRINCIPATE, a province of the kingdom of Naples, situated on the Mediterranean, between the provinces of Lavoro and Calabria; and divided into the Hither and Further Principate, with respect to the city of Naples.

PRINCIPLE, in general, is used for the cause, source, or origin of any thing.

PRINCIPLE, is also sometimes used in a synonymous sense with axiom or maxim.

PRINOS, in botany, a genus of the hexandria monogynia class. The calix consists of six segments, and the corolla of one rotated petal; and the berry contains six seeds. There are two species, both natives of America.

PRINT, the impression taken from a copperplate. See *Rolling-press* PRINTING.

PRINTER, a person who composes and takes impressions from moveable characters ranged in order, or front plates engraven, by means of ink, and a press: or from blocks of wood cut in flowers, *&c.* and taken off in various colours on calicoes, linens, silks, *&c.*

The most curious of these arts, and that which deserves the most particular explication, is the first; for to the printers of books are chiefly owing our deliverance from ignorance and error, the progress of learning, the revival of the sciences, and numberless improvements in arts, which, without this noble invention, would have been either lost to mankind, or confined to the knowledge of a few. The first printers were Guttemberg, Fust, Schoeffer, Mentel, and Koster; and the first who practised this art in England was Fred. Corseilles, who brought it over from Haerlem, in the reign of king Henry VI. The great printers famous for the correctness and elegance of their works, were Aldus, and Paulus Manutius; the two Badii; William and Frederic Morel; Oporin; Frobenius; Robert, Henry, and Charles Stephens; Gryphius, Turnebus, Torres, Commelin, Plantin, Raphelengius, Vascosan, Bleau, Crispin, and the two Elzevirs; and among these, the learned printers were the Manutii, the Stephenses, the Bodii, Turnebus, Morel, *&c.* Plantin had the title of architypographus, or arch-printer, given him

him by the king of Spain in consideration of his printing the polyglot of Antwerp. The printers of Germany, *&c.* generally cast their own letter, and sell their own books These are in many places ranked among the members of universities, and entitled to the privilege of students. In England, they are esteemed a part of the company of stationers and booksellers.

PRINTING, the art of taking impressions from characters or figures, moveable or immoveable, on paper, linen, silk, *&c.* There are three kinds of printing; the one from moveable letters, for books; another from copper-plates, for pictures; and the last from blocks, in which the representation of birds, flowers, *&c.* are cut, for printing calicoes, linens, *&c.* the first called common-press printing, the second rolling-press printing, and the last calico, *&c.* printing. The principal difference between the three consists in this, that the first is cast in relievo, in distinct pieces; the second engraven in creux; and the third cut in relievo, and generally stamped, by placing the block upon the materials to be printed, and striking upon the back of it.

Progress of PRINTING. Who the first inventors of the European method of printing books were, in what city and what year it was set on foot, are questions long disputed among the learned. In effect, as the Grecian cities contended for the birth of Homer, so do the German cities for that of printing. Mentz, Haerlem, and Strasburg, are the warmest on this point of honour. John Guttemburg, and John Fust of Mentz; John Mentel of Strasburg, and L. John Koster of Haerlem; are the persons to whom this honour is severally ascribed, by their respective countrymen; and they have all their advocates among the learned. However, their first essays were made on wooden blocks, after the Chinese manner. The book at Haerlem, the vocabulary called Catholicon, and the pieces in the Bodleian library, and that of Bennet-college, are all performed in this way; and the impression appears to have been only given on one side of the leaves, after which the two blank sides were pasted together. But they soon found the inconveniences of this method; and therefore bethought themselves of an improvement; which was by making single letters distinct from one another; and these being first done in wood, gave room for a second improvement, which was the making them of metal; and, in order to that, forming moulds, matrices, *&c.* for casting them.

From this ingenious contrivance we ought to date the origin of the present art of printing, contradistinguished from the method practised by the Chinese. And of this Schoeffer, or Scheffer, first servant, and afterwards partner and son-in-law of Fust, at Mentz, abovementioned, is pretty generally allowed to be the inventor, so that he may properly be reckoned the first printer, and the Bible which was printed with moveable letters in 1450, the first printed book; the next was Augustine de civitate Dei, then Tully's offices, printed about the year 1461. In these books they left the places eof the initial letters blank, and gave them to the illuminers to have them ornamented and painted in gold and azure, in order to render the work more beautiful, and, as some think, to make their books pass for manuscripts.

Some authors tell us, that Fust carrying a parcel of bibles with him to Paris, and offering them to sale as manuscripts; the French, upon considering the number of books, and their exact conformity to each other even to a point, and that it was impossible for the best book-writers to be so exact, concluded there was witchcraft in the case, and, by their actually indicting him as a conjurer, or threatening to do so, extorted from him the se ret: and hence the origin of the popular story of Dr Faustus.

From Mentz, the art of printing soon spread itself throughout a good part of Europe: Haerlem and Strasburg had it very early; which, as the current of authors represent it, occasioned their pretending to the honour of the invention. From Haerlem it passed to Rome in 1467; and into England in 1468, by means of Tho. Bourchier, archbishop of Canterbury, who sent W. Turner master of the robes, and W. Caxton merchant, to Haerlem to learn the art. These privately prevailing with Corseilles, an under-workman, to come over, a press was set up at Oxford and an edition of Ruffinus on the creed was printed the same year in octavo. From Oxford, Caxton brought it to London about the year 1470, and the same year it was carried to Paris. Hitherto there had been nothing printed but in Latin, and the vulgar tongues; and this first in Roman characters, then in Gothic, and at last in Italic: but in 1480, the Italians cast a set of Greek types; and they have also the honour of the first Hebrew editions, which were printed about the same time with the Greek. Towards the end of the sixteenth century there appeared various editions of books in Syriac, Arabic, Persian, Armenian, Coptic or Egyptian characters, some to gratify the curiosity of the learned, and others for the use of the Christians of the Levant. Out of Europe, the art of printing has been carried into the three other parts of the world: for Asia, we see impressions of books at Goa, and in the Philippines; at Morocco, for Africa; at Mexico, Lima, Philadelphia, New York, Boston, *&c.* for America. The Turks, indeed, rigorously prohibit printing throughout their empire, as imagining that the too frequent communication with books might occasion some change in their religion and government; yet the Jews have several editions of their books printed at Thessalonia, and even at Constantinople.

Method of PRINTING. The workmen employed in the art of printing are of two kinds: compositors, who range and dispose the letters into words, lines, pages, *&c.* according to the copy delivered them by the author; and pressmen, who apply ink upon the same, and take off the impression. The types being cast, the compositor distributes each kind by itself among the divisions of two wooden frames, an upper and an under one, called cases; each of which is divided into little cells or boxes. Those of the upper case are in number ninety-eight: these are all of the same size; and in them are disposed the capitals, small capitals, accented letters, figures, *&c.* the capitals being placed in alphabetical order. In the cells of the lower case, which are fifty-four, are placed the small letters, with the points, spaces, *&c.* The boxes are here of different sizes, the largest being for the letters most used; and these boxes are not in alphabetical order, but the cells which contain the letter oftenest wanted are nearest the compositor's hand. Each case is placed a little aslope, that the compositor may the more easily reach the upper boxes. The instrument in which the letter are set is called a composing-stick, (*ibid.* n° 2) which

consists

consists of a long and narrow plate of brass, or iron, *&c.* *c c*; on the right-side of which arises a ledge *b b*, which runs the whole length of the plate, and serves to sustain the letters, the sides of which are to rest against it: along this ledge is a row of holes, which serve for introducing the screw *f*, in order to lengthen or shorten the extent of the line, by moving the sliders *e d* farther from or nearer to the shorter ledge at the end *a*. Where marginal notes are required in a work, the two sliding-pieces *e d* are opened to a proper distance from each other, in such a manner as that while the distance between *d* and *c* forms the length of the line in the text, the distance between the two sliding-pieces forms the length of the lines for the notes on the side of the page. Before the compositor proceeds to compose, he puts a rule, or thin slip of brass-plate, cut to the length of the line, and of the same height as the letter, in the composing-stick, against the ledge, for the letter to bear against. Things thus prepared, the compositor having the copy lying before him, and his stick in his left-hand, his thumb being over the slider *d*; with the right, he takes up the letters, spaces, *&c.* one by one, and places them against the rule, while he supports them with his left thumb by pressing them to the end of the slider *d*, the other hand being constantly employed in setting in other letters: the whole being performed with a degree of expedition and address not easy to be imagined.

A little being thus composed, if it end with a word or syllable, and exactly fill the measure, there needs no further care; otherwise, more spaces are to be put in, or, else the distances lessened between the several words, in order to make the measure quite full, so that every line may end even. The spaces here used are pieces of metal exactly shaped like the shanks of the letters: these are of various thicknesses, and serve to support the letters, and to preserve a proper distance between the words; but not reaching so high as the letters, they make no impression when the work is printed. The first line being thus finished, the compositor proceeds to the next; in order to which he moves the brass-rule from behind the former, and places it before it, and thus composes another line against it after the same manner as before; going on thus till his stick is full, when he empties all the lines contained in it into the gally.

The compositor then fills and empties his composing-stick as before, till a complete page be formed; when he ties it up with a cord or pack-thread, and setting it by, proceeds to the next, till the number of pages to be contained in a sheet is completed; which done, he carries them to the imposing-stone, there to be ranged in order, and fastened together in a frame called a chase, and this is termed imposing. The chase is a rectangular iron-frame, of different dimensions, according to the size of the paper to be printed, having two cross-pieces of the same metal, called a long and short cross, mortised at each end so as to be taken out occasionally. By the different situation of these crosses the chase is fitted for different volumes: for quartos and octavos, one traverses the middle lengthwise, the other broadwise, so as to intersect each other in the centre: for twelves and twenty-fours, the short cross is shifted nearer to one end of the chase: for folios, the long cross is left entirely out, and the short one left in the middle; and for broad-sides, both crosses are set aside. To dress the chase, or range and fix the pages therein, the compositor makes use of a set of furniture, consisting of slips of wood of different dimensions, and about half an inch high, that they may be lower than the letters: some of these are placed at the top of the pages, and called head-sticks; others between them, to form the inner margin; others on the sides of the crosses, to form the outer margin, where the paper is to be doubled; and others in the form of wedges to the sides and bottom of the pages. Thus all the pages being placed at their proper distances, and secured from being injured by the chase and furniture placed about them, they are all untied, and fastened together by driving small pieces of wood called quoins, cut in the wedge-form, up between the slanting side of the foot and side sticks and the chase, by means of a piece of hard wood and a mallet; and all being thus bound fast together, so that none of the letters will fall out, it is ready to be committed to the the pressman. In this condition the work is called a form; and as there are two of these forms required for every sheet, when both sides are to be printed, it is necessary the distances between the pages in each form should be placed with such exactness, that the impression of the pages in one form shall fall exactly on the back of the pages of the other, which is called register.

As it is impossible but that there must be some mistakes in the work, either through the oversight of the compositor, or by the casual transposition of letters in the cases; a sheet is printed off, which is called a proof, and given to the corrector; who reading it over, and rectifying it by the copy, by making the alterations in the margin, it is delivered back to the compositor to be corrected.

The compositor then unlocking the form upon the correcting-stone, by loosening the quoins or wedges which bound the letters together, rectifies the mistakes by picking out the faulty or wrong letters with a slender sharp-pointed steel-bodkin, and puts others into their places. After this another proof is made, sent to the author, and corrected as before; and lastly, there is another proof, called a revise, which is made in order to see whether all the mistakes marked in the last proof are corrected.

The pressman's business is to work off the forms thus prepared and corrected by the compositor; in doing which there are four things required, paper, ink, balls, and a press. To prepare the paper for use, it is to be first wetted by dipping several sheets together in water: these are afterwards laid in a heap over each other; and to make them take the water equally, they are all pressed close down with a weight at the top. The ink is made of oil and lamp-black; for the manner of preparing which, see *Printing* Ink. The balls, by which the ink is applied on the forms, are a kind of wooden funnels with handles, the cavities of which are filled with wool or hair, as is also a piece of alum-leather or pelt nailed over the cavity, and made extremely soft by soaking in urine, and by being well rubbed. One of these the pressman takes in each hand; and applying one of them to the ink-block, daubs and works them together to distribute the ink equally and then blackens the form which is placed on the press, by beating with the balls upon the face of the letter.

The printing-press represented in Plate CXLVII. fig. 1.

nº 1. is a very curious, though complex machine. The body confifts of two ftrong cheeks, *a a*, placed perpendicularly, and joined together by four crofs-pieces; the cap *b*; the head *c*, which is moveable, being partly fuftained by two iron-pins, or long bolts, that pafs the cap; the fhelves *d d*, which ferve to keep fteady a part called the hofe; and the winter *e*, which bears the carriage, and fuftains the effort of the prefs beneath. The fpindle *f* is an upright piece of iron pointed with fteel, having a male-fcrew which goes into the female one in the head about four inches. Through the eye *g* of this fpindle is faftened the bar *k*, by which the preffman makes the impreffion. Part of the fpindle is inclofed in a fquare wooden frame called the hofe *h*, and its point works into a brafs-pan fupplied with oil, which is fixed to an iron plate let into the top of the platten. At each corner of the hofe, there is an iron-hook faftened with pack-thread to thofe at each end of the platten *i*, in fuch a manner as to keep it perfectly level. The carriage *l l* is placed a foot below the platten, having its fore-part fupported by a prop called the fore-ftay, while the other refts on the winter. On this carriage, which fuftains the plank, are nailed two long iron-bars or ribs, and on the plank are nailed fhort pieces of iron or fteel called cramp-irons, equally tempered with the ribs, and which flide upon them when the plank is turned in or out. Under the carriage is fixed a long piece of iron called the fpit, with a double wheel in the middle, round which leather-girts are faftened, nailed to each end of the plank; and to the outfide of the fpit is fixed a rounce *m*, or handle to turn round the wheel. Upon the plank is a fquare frame or coffin, in which is inclofed a polifhed ftone on which the form *n* is laid; at the end of the coffin are three frames, *viz.* the two tympans and frifket: the tympans *o* are fquare, and made of three flips of very thin wood, and at the top a piece of iron ftill thinner; that called the outer tympan is faftened with hinges to the coffin: they are both covered with parchment; and between the two are placed blankets, which are neceffary to take off the impreffion of the letters upon the paper. The frifket *p* is a fquare frame of thin iron, faftened with hinges to the tympan; it is covered with paper cut in the neceffary places, that the fheet, which is put between the frifket and the great or outward tympan, may receive the ink, and that nothing may hurt the margins. To regulate the margins, a fheet of paper is faftened upon this tympan, which is called the tympan-fheet; and on each fide is fixed an iron point, which makes two holes in the fheet, which is to be placed on the fame points, when the impreffion is to be made on the other fide. In preparing the prefs for working, the parchment which covers the outer tympan is wetted till it is very foft, in order to render the impreffion more equable; the blankets are then put in, and fecured from flipping by the inner tympan: then while one preffman is beating the letter with the balls *q*, covered with ink taken from the ink-block, the other perfon places a fheet of white paper on the tympan-fheet, turns down the frifket upon it to keep the paper clean and prevent its flipping; then bringing the tympans upon the form, and turning the rounce, he brings the form with the ftone, *&c.* weighing about 300 pounds weight, under the platten; pulls with the bar, by which means the platten preffes the blankets and paper clofe upon the letter, whereby half the form is printed; then eafing the bar, he draws the form ftill forward, gives a fecond pull; and letting go the bar, turns back the form, takes up the tympans and frifket, takes out the printed fheet, and lays on a frefh one; and this is repeated till he has taken off the impreffion upon the full number of fheets the edition is to confift of. One fide of the fheet being thus printed, the form for the other is laid upon the prefs, and worked off in the fame manner.

Chinefe PRINTING, is performed from wooden planks or blocks, cut like thofe ufed in printing of callico, paper, cards *&c.*

Rolling-prefs PRINTING, is employed in taking off prints or impreffions from copper-plates engraven, etched, or fcraped as in mezzotintos. See ENGRAVING.

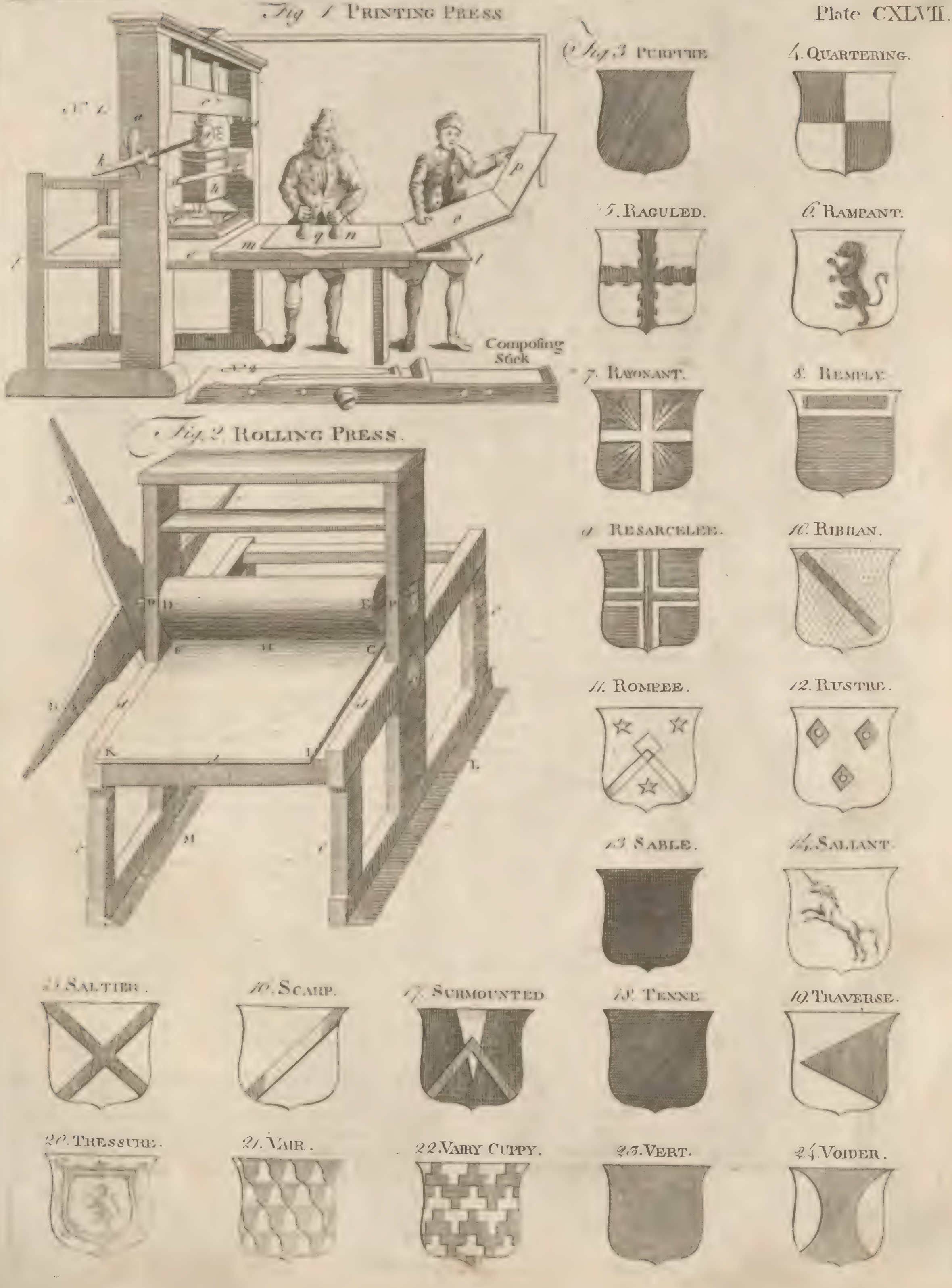
This art is faid to have been as ancient as the year 1540, and to owe its origin to Finiguerra, a Florentine goldfmith, who pouring fome melted brimftone on an engraven plate, found the exact impreffion of the engraving left in the cold brimftone, marked with black taken out of the ftrokes by the liquid fulphur: upon this he attempted to do the fame on filver-plates with wet paper, by rolling it fmoothly with a roller; and this fucceeded: but this art was not ufed in England till the reign of king James I when it was brought from Antwerp by Speed. The form of the rolling-prefs, the compofition of the ink ufed therein, and the manner of applying both in taking off prints, are as follow.

The rolling-prefs AL (Plate CXLVII. fig. 2) may be divided into two parts, the body and carriage: the body confifts of two wooden cheeks PP placed perpendicularly on a ftand or foot LM, which fuftains the whole prefs. From the foot likewife are four other perpendicular pieces *c,c,c,c*, joined by other crofs or horizontal ones *d,d,d*, which ferve to fuftain a fmooth even plank or table HIK, about four feet and a half long, two feet and a half broad, and an inch and a half thick. Into the cheeks go two wooden cylinders or rollers, DE, FG, about fix inches in diameter, borne up at each end by the cheeks, whofe ends, which are leffened to about two inches diameter, and called trunnions, turn in the cheeks about two pieces of wood in form of half-moons, lined with polifhed iron to facilitate the motion. Laftly, to one of the trunnions of the upper roller is faftened a crofs, confifting of two levers A,B, or pieces of wood, traverfing each other, the arms of which crofs ferve inftead of the bar or handle of the letter-prefs, by turning the upper roller, and when the plank is between the two rollers, giving the fame motion to the under one, by drawing the plank forward and backward.

The ink ufed for copper-plates, is a compofition made of the ftones of peaches and apricots, the bones of fheep, and ivory, all well burnt, and called Frankfort black, mixt with nut-oil that has been well boiled, and ground together on a marble, after the fame manner as painters do their colours.

The method of printing from copper-plates is as follows. They take a fmall quantity of this ink on a rubber made of linen-rags, ftrongly bound about each other, and therewith fmear the whole face of the plate as it lies on a grate over a charcoal-fire. The plate being fufficiently inked, they firft wipe it over with a foul rag, then with the

Plate CXLVII.



the palm of their left hand, and then with that of the right; and to dry the hand and forward the wiping, they rub it from time time in whiting. In wiping the plate perfectly clean, yet without taking the ink out of the engraving, the addrefs of the workman confifts. The plate thus prepared, is laid on the plank of the prefs; over the plate is laid the paper, firft well moiftened, to receive the impreffion, and over the paper two or three folds of flannel. Things thus difpofed the arms of the crofs are pulled and by that means the plate with its furniture paffed through between the rollers, which pinching very ftrongly, yet equally, preffes the moiftened paper into the ftrokes of the engraving, whence it licks out the ink.

PRIOR, the fuperior of a convent of monks, or the next under the abbot. See ABBOT.

PRISCILLIANISTS, in church-hiftory, Chriftian heretics, fo called from their leader Prifcillian, a Spaniard by birth, and bifhop of Avila. He is faid to have practifed magic, and to have maintained the principal errors of the Manichees; but his peculiar tenet was, that it is lawful to make falfe oaths, in order to fupport one's caufe and intereft.

PRISM, an oblong folid, contained under more than four planes whofe bafes are equal, parallel, and alike fituated.

PRIVATEERS, in maritime affairs, a kind of private fhips of war, fitted out by private perfons at their own expence; who have leave granted them to keep what they can take from the enemy, allowing the admiral his fhare. See LETTER *of Marque*.

PRIVATION, in general, denotes the abfence or want of fomething; in which fenfe, darknefs is only a privation of light.

PRIVATIVE, in grammar, a particle which, when prefixed to a word, changes it into a contrary fenfe. See GRAMMAR.

PRIVET, in botany. See LIGUSTRUM.

PRIVILEGE, in law, fome peculiar benefit granted to certain perfons or places, contrary to the ufual courfe of the law.

Privileges are faid to be perfonal or real. Perfonal privileges are fuch as are extended to peers, embaffadors, members of parliament and of the convocation, and their menial fervants, *&c.* See PEER, EMBASSADOR, PARLIAMENT, *&c.*

PRIVILEGED DEBTS, in Scots law. See LAW, Tit. xxviii. 19.

PRIVY-COUNCIL. See *Privy*-COUNCIL.

PRIVY SEAL. See SEAL.

PRIZE, in maritime affairs, a veffel taken at fea from the enemies of a ftate, or from pirates; and that either by a man of war, a privateer, *&c.* having a commiffion for that purpofe.

PROBABILITY, is nothing but the appearance of the agreement or difagreement of two ideas by the intervention of proofs whofe connection is not conftant and immutable, or is not perceived to be fo; but is, or appears for the moft part to be fo; and is enough to induce the mind to judge the propofition to be true or falfe, rather than the contrary. See LOGIC and METAPHYSICS.

PROBATE of a will or teftament, in law, is the exhibiting and proving of laft wills and teftaments before the ecclefiaftical judge delegated by the bifhop who is ordinary of the place where the party died.

PROBATION, in the univerfities, is the examination and trial of a ftudent who is about to take his degrees.

PROBATION, in Scots law. See LAW, Tit. xxxi. 1, *et feq.*

PROBATIONER, in the church of Scotland, a ftudent in divinity, who bringing a certificate from a profeffor in an univerfity of his good morals, and his having performed his exercifes to approbation, is admitted to undergo feveral trials.

PROBE, a furgeon's inftrument for examining the circumftances of wounds, ulcers, and other cavities, fearching for ftones in the bladder, *&c.*

PROBLEM, in logic, a propofition that neither appears abfolutely true nor falfe; and, confequently, may be afferted either in the affirmative or negative.

PROBLEM, in geometry, is a propofition, wherein fome operation or conftruction is required; as to divide a line or angle, erect or let fall perpendiculars, *&c.* See GEOMETRY.

PROBOSCIS, in natural hiftory, is the trunk or fnout of an elephant, and fome other animals and infects.

PROCATARCTIC CAUSE, in medicine, the pre-exifting, or pre-difpofing caufe or occafion of a difeafe.

PROCELEUSMATICUS, in the ancient poetry, a foot confifting of four fhort fyllables, or two pyrrhichiufes; as, *hominibus*,

PROCELLARIA, in ornithology, a genus of birds, belonging to the order of anferes. The beak is fomewhat compreffed, and without teeth; the mandibles are equal, the fuperior one being crooked at the point; the feet are palmated, the hind-claw being feffil, without any toe. There are fix fpecies, principally diftinguifhed by their colour.

PROCESS, in law, denotes the proceedings in any caufe, real or perfonal, civil or criminal, from the original writ to the end thereof.

PROCESS, in chemiftry, the whole courfe of an experiment or feries of operations tending to produce fomething new.

PROCESS, in anatomy, denotes any protuberance or eminence in a bone.

PROCESSION, a ceremony in the Romifh church, confifting of a formal march of the clergy and people, putting up prayers, *&c.* and in this manner vifiting fome church, *&c.* They have alfo proceffions of the hoft or facrament. See HOST.

PROCLAMATION, a public notice given of any thing of which the king thinks proper to advertife his fubjects.

Proclamations are a branch of the king's prerogative; and no perfon can make them without the king's authority, except mayors of towns, *&c.* by cuftom of privilege. Proclamations which require the people to do or not to do certain things, have the force of laws; but then they are fuppofed to be confiftent with the laws already in being, otherwife they are fuperfeded.

PROCONSUL, a Roman magiftrate, fent to govern a province with confular authority.

PROCREATION, the begetting and bringing forth children. See GENERATION and MIDWIFERY.

PROCTOR, a perfon commiffioned to manage another perfon's caufe in any court of the civil or ecclefiaftical law.

PROCURATION, an act or inftrument by which a perfon

is impowered to treat, tranſact, receive, *&c.* in another perſon's name.

PROCURATOR, a perſon who has a charge committed to him to act for another.

PROCYON, in aſtronomy. See ASTRONOMY, p. 487.

PRODUCT, in arithmetic. See ARITHMETIC, p. 371.

PROFANATION, the acting diſreſpectfully to ſacred things.

PROFANE, a term uſed in oppoſition to holy; and, in general, is applied to all perſons who have not the ſacred character, and to things which do not belong to the ſervice of religion.

PROFESSION, among the Romaniſts, denotes the entering into a religious order, whereby a perſon offers himſelf to God by a vow of inviolably obſerving obedience, chaſtity, and poverty.

PROFESSOR, in the univerſities, a perſon who teaches or reads public lectures in ſome art or ſcience from a chair for the purpoſe.

PROFILE, in architecture, the draught of a building, fortification, *&c.* wherein are expreſſed the ſeveral heights, widths, and thickneſſes, ſuch as they would appear were the building cut down perpendicularly from the roof to the foundation.

PROFLUVIUM, in medicine, denotes a flux, or liquid evacuation, of any thing.

PROGNOSTICS, among phyſicians, ſignifies a judgment concerning the event of a diſeaſe; as, whether it ſhall end in life or death, be ſhort or long, mild or malignant, *&c.*

PROGRESSION, in general, denotes a regular advancing, or going forward in the ſame courſe and manner. See ARITHMETIC, ALGEBRA, and GEOMETRY.

PROJECTION, in mechanics, the act of communicating motion to a body, from thence called projectile. See MECHANICS.

PROJECTURE, in architecture, the out-jetting, prominency, or emboſſing, which the mouldings and other members have beyond the naked wall, column, *&c.* See ARCHITECTURE.

PROLAPSUS, in ſurgery, a prolapſion, or falling out of any part of the body from its natural ſituation; thus we ſay prolapſus inteſtini, a prolapſion of the inteſtine, *&c.* See SURGERY.

PROLATE, in geometry, an epithet applied to a ſpheroid produced by the revolution of a ſemi-ellipſis about its larger diameter.

PROLEGOMENA, certain preparatory obſervations or diſcourſes prefixed to a book, *&c.* containing ſomething neceſſary for the reader to be appriſed of, to enable him the better to underſtand the book, or to enter deeper into the ſcience, *&c.*

PROLEPSIS, a figure in rhetoric, by which we anticipate or prevent what might be objected by the adverſary.

PROLEPTIC, an epithet applied to a periodical diſeaſe which anticipates, or whoſe paroxyſm returns ſooner and ſooner every time, as is frequently the caſe in agues.

PROLIFIC, ſomething that has the qualities neceſſary for generating.

PROLIXITY, in diſcourſe, the fault of entering into too minute a detail, of being too long, preciſe, and circumſtantial, even to a degree of tedioufneſs.

PROLOGUE, in dramatic poetry, a diſcourſe addreſſed to the audience before the drama or play begins. The original intention was to advertiſe the audience of the ſubject of the piece, and to prepare them to enter more eaſily into the action, and ſometimes to make an apology for the poet.

PROMETHEUS, in the ancient aſtronomy, the name of the conſtellation now called Hercules. See ASTRONOMY, p. 487.

PROMISE, in law, is when upon any valuable conſideration one binds himſelf by word of mouth to another to perform a thing agreed on.

PROMONTORY, in geography, a high point of land or rock projecting out into the ſea; the extremity of which towards the ſea, is called a cape, or headland.

PROMULGATED, ſomething publiſhed or proclaimed, and generally applied to a law, to denote the publiſhing or proclaiming to the people.

PRONATION. See ANATOMY, p. 179.

PRONATORS, in anatomy. See ANATOMY, p. 198.

PRONOUN, in grammar, a declinable part of ſpeech, which being put inſtead of a noun, points out ſome perſon or thing. See GRAMMAR.

PRONUNCIATION, in grammar, the manner of articulating or ſounding the words of a language. See GRAMMAR.

PROOF, in law, *&c.* denotes the mediums or arguments uſed to evince the truth of any thing.

PROPAGATION, the act of multiplying the kind. See GENERATION.

PROPER, ſomething naturally and eſſentially belonging to any thing.

PROPERTY, in a general ſenſe, that which conſtitutes or denominates a thing proper; or it is a particular virtue or quality which nature has beſtowed on ſome things excluſive of all others: thus colour is a property of light; extenſion, figure, diviſibility, and impenetrability, are properties of body.

PROPERTY, in law, is deſcribed to be the higheſt right a perſon has, or can have, to any thing.

PROPHECY, a prediction made by divine inſpiration.

PROPHET, in general, a perſon who foretels future events; but is particularly applied to ſuch inſpired perſons among the Jews as were commiſſioned by God to declare his will and purpoſes to that people. Among the canonical books of the Old Teſtament, we have the writings of ſixteen prophets, four of which are denominated the greater prophets, *viz.* Iſaiah, Jeremiah, Ezekiel, and Daniel, ſo called from the length or extent of their writings, which exceed thoſe of the others, *viz* Hoſea, Joel, Amos, Obadiah, Jonah, Micah, Nahum, Habakkuk, Zephaniah, Haggai, Zechariah, and Malachi, who are called the leſſer prophets from the ſhortneſs of their writings. The Jews do not place Daniel among the prophets, becauſe, they ſay, he lived the life of a courtier rather than that of a prophet.

PROPITIATION, in theology, a ſacrifice offered to God to aſſwage his wrath, and render him propitious. Among the Jews there were both ordinary and public ſacrifices, as holocauſts, *&c.* offered by way of thankſgiving; and extraordinary ones, offered by particular perſons guilty of any crime, by way of propitiation. The Romiſh church believe the maſs to be a ſacrifice of propitiation for the living and the dead. The reformed churches allow of

of no propitiation but that one offered by Jesus Christ on the cross.

PROPOLIS, the name of a certain substance more glutinous and tenaceous than wax, with which the bees stop up all the holes or cracks in the sides of their hives. See APIS.

PROPONTIS, or *Sea of* MARMORA, divides Europe from Asia; having the Bosphorus on the north-east, by which it has a communication with the Euxine sea; and the Hellespont on the south-west, by which it communicates with the Archipelago. It is one hundred and twenty miles long, and in some places upwards of forty broad.

PROPORTION. When two quantities are compared one with another, in respect of their greatness or smallness, the comparison is called ratio, rate, or proportion. See ALGEBRA, ARITHMETIC, and GEOMETRY.

PROPOSITION, in logic, part of an argument wherein some quality, either negative or positive, is attributed to a subject. See LOGIC.

PROPOSITION, in mathematics, is either some truth advanced, and shewn to be such by demonstration; or some operation proposed, and its solution shewn.

PROPREFECT, among the Romans, the prefect's lieutenant, or an officer whom the prefect of the pretorium commissioned to do any part of his duty in his place.

PROPRETOR, a Roman magistrate, who, having discharged the office of pretor at home, was sent into a province to command there with his former pretorial authority.

PROROGATION, the act of prolonging, adjourning, or putting off to another time. The difference between a prorogation and an adjournment of parliament is, that by prorogation the session is ended, as such bills as passed in either house, or both houses, and had not the royal assent, must at the next assembly begin again.

PROSCRIPTION, a publication made in the name of the chief or leader of a party, whereby he promises a reward to any one who shall bring him the head of one of his enemies.

PROSE, the natural language of mankind, loose, and unconfined by poetical measures, rhymes, *&c.* in which sense it stands opposed to verse.

PROSECUTOR, in law, he that pursues a cause in another's name.

PROSELYTE, a new convert to some religion or religious sect.

PROSPERPINACA, in botany, a genus of the triandria trigynia class. The calix consists of three segments; it has no corolla, and but one seed. There is only one species, a native of Virginia.

PROSODY, that part of grammar which treats of the quantities and accents of syllables. See GRAMMAR.

PROSOPOPOEIA, a figure in rhetoric, whereby we raise qualities of things inanimate into persons.

PROSTATÆ, in anatomy. See ANATOMY, p. 273.

PROSTYLE, in architecture, a range of columns in the front of a temple.

PROTEA, in botany, a genus of the tetrandria monogynia class. The petal consists of four segments surrounding the germen; it has no proper calix; and the receptacle is paleaceous. There are two species, both natives of the Cape of Good Hope.

PROTECTOR, a person who undertakes to shelter and defend the weak, helpless, and distressed.

PROTESTANT, a name first given in Germany to those who adhered to the doctrine of Luther; because, in 1529, they protested against a decree of the emperor Charles V. and the diet Spires; declaring that they appealed to a general council. The same name has also been given to those of the sentiments of Calvin, and is now become a common denomination for all those of the reformed churches.

PROTHONOTARY, a term which properly signifies first notary, and which was anciently the title of the principal notaries of the emperors of Constantinople.

PROTOTYPE, is the original or model after which a thing was formed; but chiefly used for the patterns of things to be engraved, cast, *&c.*

PROTRACTOR, the name of an instrument used for protracting or laying down on paper the angles of a field, or other figure. See GEOMETRY.

PROTUBERANCE, is an eminence, whether natural or preternatural, that projects or advances out beyond the rest.

PROVEDITOR, an officer in several parts of Italy, particularly at Venice, who has the direction of matters relating to policy.

PROVENCE, a province or government of France, bounded by Dauphine on the north; by Piedmont on the east; by the Mediterranean on the south; and by the river Rhone, which separates it from Languedoc, on the west: it is about an hundred miles long, and near as many broad.

PROVERB, according to Camden, is a concise, witty, and wise speech, grounded upon experience, and for the most part containing some useful instructions.

Book of PROVERBS, a canonical book of the Old Testament, containing a part of the proverbs of Solomon the son of David king of Israel. The first twenty-four chapters are acknowleged to be the genuine work of that prince; the next five chapters are a collection of several of his proverbs, made by order of king Hezekiah; and the two last seem to have been added, though belonging to different and unknown authors, Agur the son of Jakeh, and king Lemuel.

In this excellent book are contained rules for the conduct of all conditions of life; for kings, courtiers, masters, servants, fathers, mothers, children, *&c.*

PROVIDENCE, the conduct and direction of the several parts of the universe, by a superior intelligent Being.

PROVIDENCE-PLANTATION, a colony of New-England, which, with Rhode-island, constitutes a charter government: its chief town is Newport.

PROVIDENCE is also one of the Bahama islands, planted and fortified by the English: W. long. 78°, N. lat. 25°.

PROVINCE, in Roman antiquity, a country of considerable extent, which, upon being entirely reduced under the Roman dominion, was new-modelled according to the pleasure of the conquerors, and subjected to the command of annual governors sent from Rome; being commonly obliged to pay such taxes and contribution as the senate thought fit to demand.

PROVINCE, in geography, a division of a kingdom or state, comprising

comprising several cities, towns, *&c.* all under the same government, and usually distinguished by the extent either of the civil or ecclesiastical jurisdiction.

PROVINCIAL, something relating to a province. See the preceding article.

PROVOST, of a city or town, is the chief municipal magistrate in several trading cities, particularly Edinburgh, Paris, *&c.* being much the same with mayor in other places.

He presides in city-courts, and, together, with the baillies, who are his deputies, determines in all differences that arise among citizens.

The provost of Edinburgh, as well as of all the other considerable towns in Scotland, has the title of lord; and the former calls yearly conventions of the royal boroughs to Edinburgh by his missives.

PROW, denotes the head or fore-part of a ship, particularly in a galley, being that which is opposite to the poop or stern.

PROXIMITY, denotes the relation of nearness, either in respect of place, blood, or alliance.

PROXY, a person who officiates as a deputy in the room of another.

PRUCH, or Brugg, a town of Austria, in Germany, twenty-two miles south-east of Vienna.

PRUCK, or Bruch, of Stiria, in Germany, sixty miles south-west of Vienna.

PRUNES, are plumbs dried in the sunshine, or in an oven.

PRUNING, in gardening and agriculture, is the lopping off the superfluous branches of trees, in order to make them bear better fruit, grow higher, or appear more regular.

PRUNUS, in botany, a genus of the icosandria monogynia class. The calix consists of five segments, and the corolla of five petals; and the shell of the drupe is full of prominent sutures. There are 13 species, five of them natives of Britain, *viz.* the insititia, or black bullace-tree; the spinosa, or sloe-tree; the padus, or birds cherry; the avium, or common wild cherry; and the cerasus, or black cherry.

PRURITIS, denotes an itching sensation.

PRUSSIA, a province of Poland, situated on the coast of the Baltic sea, and divided into regal and ducal Prussia, the first subject to Poland, and the last to the king of Prussia.

PRYTANES, in Grecian antiquity, were the presidents of the senate, whose authority consisted chiefly in assembling the senate; which, for the most part, was done once every day.

The senate consisted of five hundred, fifty senators being elected out of each tribe; after which, lots were cast, to determine in what order the senators of each tribe should preside, which they did by turns, and during their presidentship were called prytanes. However, all the fifty prytanes of the tribes did not govern all at once, but ten at a time, *viz.* for seven days; and after thirty-five days, another tribe came into play, and presided for other five weeks; and so of the rest.

PSALM, a divine song or hymn; but chiefly appropriated to the hundred and fifty Psalms of David, a canonical book of the Old Testament.

Most of the Psalms have a particular title, signifying either the name of the author, the person who was to set it to music or sing it, the instrument that was to be used, or the subject and occasion of it. Some have imagined, that David was the sole author of the book of Psalms; but the titles of many of them prove the contrary, as Psalm xix. which appears to have been written by Moses. Many of the Psalms are inscribed with the names Korah, Jeduthun, *&c.* from the persons who were to sing them.

PSALMODY, the art or act of singing psalms. See the preceding article.

PSALTER, the same with the book of Psalms. See Psalm.

Among the religious, in the Popish countries, the term psalter is also given to a large chaplet or rosary, consisting of an hundred and fifty beads, according to the number of psalms in the palter.

PSALTERY, a musical instrument, much in use among the ancient Hebrews, who called it nebel.

We know little or nothing of the precise form of the ancient psaltery.

PSIDIUM, in botany, a genus of the icosandria monogynia class. The calix consists of five segments, and the corolla of five petals; the berry has but one cell, containing many seeds. There are two species, both natives of India.

PSITTACUS, in ornithology, a genus belonging to the order of picæ. The beak is hooked, the superior mandible being furnished with a moveable wax; the nostrils are placed at the base of the beak; the tongue is fleshy, blunt, and entire; and the feet are fitted for climbing. There are 47 species, distinguished by their colour, and the length of their tails. This genus includes the parrot-kind, which are all natives of warm climates.

PSOAS, in anatomy. See Anatomy, p. 203.

PSORALIA, in botany, a genus of the diadelphia decandria class. The calix is intersperfed with fleshy points, of the length of the legumen, which contains one seed. There are 14 spectes, none of them natives of Britain.

PTARMICA, in botany. See Achillæa.

PTELEA, in botany, a genus of the tetrandia monogynia class. The calix consists of four segments, and the corolla of four petals; the fruit is a roundish membrane, with one seed in the centre. The species are two, none of them natives of Britain.

PTERIS, in botany, a genus of the cryptogamia filicum class. The fructification is situate in lines near the margine. There are 19 species, only one of them, *viz.* the aquilina, or female fern, is a native of Britain.

PTERYGOID, something resembling a wing.

PTERYGOIDÆUS, in anatomy. See Anatomy, p. 221.

PTISAN, is properly barley decorticated, or deprived of its hulls, by beating in a mortar, as was the ancient practice, though the cooling potion, obtained by boiling such barley in water, and afterwards sweetening the liquor with liquorice-root, is what at present goes by the name of ptisan: and to render it laxative, some add a little sena, or other herb of the same intention.

PTOLEMAIC *System of Astronomy*, is that invented by Claudius Ptolemæus, a celebrated astronomer and mathematician of Pelusium, in Egypt, who lived in the beginning of the IId century of the Christian æra.

This hypothesis supposes the earth immoveably fixed in the centre, not of the world only, but also of the universe:

verſe; and that the ſun, the moon, the planets, and ſtars, all move about it, from eaſt to weſt, once in twenty-four hours, in the order following, *viz.* the moon next to the earth, then mercury, venus, the ſun, mars, jupiter, ſaturn, the fixed ſtars, the firſt and ſecond cryſtalline heavens, and above all the fiction of their primum mobile.

PTYALISM, in medicine, a ſalivation, or frequent and copious diſcharge of ſaliva.

PUBERTY, among civilians, *&c.* the age wherein a perſon is capable of procreation, or begetting children. See LAW.

PUBES, among anatomiſts, *&c.* denotes the middle part of the hypogaſtric region of the abdomen, lying between the two inguina or groins. See ANATOMY, p. 257.

PUBLICAN, among the Romans, one who farmed the taxes and public revenues.

PUBLICATION, the act of making a thing known to the world; the ſame with promulgation.

PUDENDA, the parts of generation in both ſexes. See ANATOMY, p. 270.

PUERILITY, in diſcourſe, is defined by Longinus, to be a thought, which, by being too far-fetched, becomes flat and inſipid. Puerility, he adds, is the common fault of thoſe who affect to ſay nothing but what is brilliant and extraordinary.

PUGIL, in phyſic, *&c.* ſuch a quantity of flowers, ſeeds, or the like, as may be taken up between the thumb and two fore-fingers.

It is eſteemed to be the eighth part of the manipule or handful.

PULEX, in zoology, a genus of inſects belonging to the order of aptera. It has ſix feet fitted for leaping, and two eyes; the feelers are like threads; the roſtrum is inflected, ſetaceous, and armed with a ſting; and the belly is compreſſed. There are two ſpecies, *viz.* the irritans, with a proboſcis ſhorter than its body, a native of Europe and America: and the penetrans, with a proboſcis longer than its body, a native of America.

PULLEY, in mechanics, one of the mechanical powers. See MECHANICS.

PULMO, the LUNGS, in anatomy. See ANATOMY, p. 280.

PULMONARIA, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel-ſhaped; and the calix has five ſides. There are ſeven ſpecies, two of them natives of Britain, *viz.* the officinalis, or buglos-cowſlips, the leaves of which are reckoned pectoral and cordiac; and the maritima, or ſea-bugloſs.

PULMONARY VESSELS, in anatomy. See ANATOMY, Part III. and IV. and p. 280.

PULP, in pharmacy, the fleſhy and ſucculent part of fruits, extracted by infuſion or boiling, and paſſed through a ſieve.

PULPIT, an elevated place in a church, whence ſermons are delivered: the French give the ſame name to a reading-deſk.

PULSATILLA, in botany. See ANEMONE.

PULSE, in the animal œconomy, denotes the beating or throbbing of the heart and arteries.

With regard to motion, the pulſes are reckoned only four, great and little, quick and ſlow. When quickneſs and greatneſs are joined together, it becomes violent; and when it is little and ſlow, it is called a weak pulſe. They are alſo ſaid to be frequent and rare; equal and unequal; but theſe are not the eſſential affections of motion. Frequency and quickneſs are often confounded with each other. A pulſe is ſaid to be hard or ſoft, with regard to the artery, according as it is tenſe, renitent, and hard, or flaccid, ſoft, and lax. Add to theſe, a convulſive pulſe; which does not proceed from the blood, but from the ſtate of the artery, and is known by a tremulous ſubſultory motion, and the artery ſeems to be drawn upwards: this, in acute fevers, is the ſign of death; and is ſaid to be the pulſe in dying perſons, which is likewiſe generally unequal and intermitting. A great pulſe ſhews a more copious afflux of the blood to the heart, and from thence into the arteries; a little pulſe, the contrary.

PULSE is alſo uſed for the ſtroke with which any medium is affected by the motion of light, ſound, *&c.* through it.

PULSE, in botany, a term applied to all thoſe grains or ſeeds which are gathered with the hand, in contradiſtinction to corn, *&c.* which are reaped, or mowed: or it is the ſeed of the leguminous kind of plants, as beans, vetches, *&c.* but it is by ſome uſed for artichokes, aſparagus, *&c.*

PULVERIZATION, the art of pulverizing, or reducing a dry body into a fine powder; which is performed in friable bodies, by pounding or beating them in a mortar, *&c.*

PULVIS, a POWDER. See POWDER.

PUMICE, in natural hiſtory, a flag or cinder of ſome foſſil, originally bearing another form, and only reduced to this ſtate by the action of the fire, though generally ranked by authors among the native ſtones. It is a lax and ſpungy matter, frequently of an obſcure ſtriated texture in many parts, and always very cavernous and full of holes; it is hard and harſh to the touch, but much lighter than any other body that comes under the claſs of ſtones. It is found in maſſes of different ſizes, and of a perfectly irregular ſhape, from the bigneſs of a pigeon's egg, to that of a buſhel. We have it from many parts of the world, but particularly from about the burning mountains Ætna, Veſuvius, and Hecla, by whoſe eruptions it is thrown up in vaſt abundance; and being by its lightneſs ſupported in the air, is carried into ſeas at ſome diſtance by the winds, and thence to diſtant ſhores. The great uſe of the pumice among the ancients, ſeems to have been as a dentifrice, and at preſent it is retained in the ſhops on the ſame account.

PUMP, in hydraulics. See HYDROSTATICS, p. 808. *&c.*

Air-PUMP. See PNEUMATICS, p. 491.

PUN, or PUNN, a conceit ariſing from the uſe of two words that agree in ſound, but differ in the ſenſe. Ariſtotle deſcribes two or three kinds of puns among the beauties of good writing, and produces inſtances of them out of ſome of the greateſt authors in the Greek tongue. Cicero has ſprinkled ſeveral of his works with puns; and in his book, where he lays down the rules of oratory, quotes abundance of ſayings, which he calls pieces of wit, that upon examination prove perfect puns.

PUNCH, an inſtrument of iron or ſteel, uſed in ſeveral arts, for the piercing or ſtamping holes in plates of metal, *&c.* being ſo contrived as not only to perforate, but to cut out and take away the piece.

PUNCHEON, a little block or piece of ſteel, on one end whereof is ſome figure, letter, or mark, engraven either

in creux or relievo; impreſſions whereof are taken on metal, or ſome other matter, by ſtriking it with a hammer on the end not engraved.

Puncheon is alſo a meaſure for liquids, containing an hogſhead and one third, or eighty-four gallons.

PUNCTUATION, in grammar, the art of pointing, or of dividing a diſcourſe into periods, by points expreſſing the pauſes to be made in the reading thereof.

Punctum saliens, in anatomy, the firſt rudiments of the heart in the formation of the fœtus, where a throbbing motion is perceived.

PUNCTURE, in ſurgery, any wound made by a ſharp-pointed inſtrument.

PUNICA, the Pomegranate-tree, in botany, a genus of the icoſandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; the apple has many cells, containing many ſeeds. There are two ſpecies, both natives of warm climates.

PUNISHMENT, in law, the penalty which a perſon incurs on the breach or tranſgreſſion of any law.

PUPIL, in the civil law, a boy or girl not yet arrived at the age of puberty, *i. e.* the boy under fourteen years, the girl under twelve.

Pupil is alſo uſed in univerſities, *&c.* for a youth under the education or diſcipline of any perſon.

Pupil, in anatomy. See Anatomy, p. 289.

PURCHASE, in law, the buying or acquiring of lands, *&c.* with money, by deed or agreement, and not by deſcent or right of inheritance.

PURE, ſomething free from any admixture of foreign or heterogeneous matters: thus we ſay pure fire, *&c.*

PURFLEW, a term in heraldry, expreſſing ermins, peans, or any of the furs, when they compoſe a bordure round a coat of arms: thus they ſay, he beareth gules a bordure, purflew, vairy; meaning that the bordure is vairy.

PURGATION, the art of purging, ſcouring, or purifying a thing, by ſeparating, or carrying off any impurities found therein: thus,

PURGATIVE, a medicament which evacuates the impurities of the body by ſtool, called alſo cathartics.

PURGATORY, a place in which the juſt who depart out of this life, are ſuppoſed to expiate certain offences which do not merit eternal damnation.

Broughton has endeavoured to prove, that this notion has been held by Pagans, Jews, and Mahometans, as well as by Chriſtians.

The doctrine of purgatory is a very lucrative article to the clergy of the Romiſh church, who are very liberally paid for maſſes and prayers for the ſouls of the deceaſed. We are told by ſome of their doctors, that purgatory is a ſubterraneous place ſituated over the hell of the damned, where ſuch ſouls as have not yet made ſatisfaction to divine juſtice for their ſins, are purged by fire, after a wonderful and incomprehenſive manner: and here they are purified from thoſe dregs which hinder them from entering into their eternal country, as the catechiſm of the council of Trent expreſſes it.

PURIFICATION, in matters of religion, a ceremony which conſiſts in cleanſing any thing from a ſuppoſed pollution or defilement.

The Pagans, before they ſacrificed, uſually bathed or waſhed themſelves in water; and they were particularly careful to waſh their hands, becauſe with theſe they were to touch the victims conſecrated to the gods. It was alſo cuſtomary to waſh the veſſel with which they made their libations. The Mahometans uſe purifications as previous to the duty of prayer: theſe alſo are of two kinds; either bathing; or only waſhing the face, hands and feet. The firſt is requeſted only in extraordinary caſes, as after having lain with a woman, touched a dead *&c.* But leſt ſo neceſſary a preparation for their devotion ſhould be omitted, either where water cannot be had, or when it may be of prejudice to a perſon's health, they are allowed in ſuch caſes to make uſe of fine ſand or duſt inſtead of it; and then they perform this duty by clapping their open hands on the ſand, and paſſing them over the parts, in the ſame manner as if they were dipped in water.

There were alſo many legal purifications among the Hebrews. When a woman was brought to bed of a male-child, ſhe was eſteemed impure for forty days; and when of a female, for ſixty; at the end of which time ſhe carried a lamb to the door of the temple, to be offered for a burnt-offering, and a young pigeon or turtle for a ſin-offering, and by this ceremony ſhe was cleanſed or purified.

PURIM, or *the feaſt of lots*, a ſolemn feſtival of the Jews, inſtituted in memory of the deliverance they received from Haman's wicked attempt to deſtroy them, by means of Mordecai and Eſther.

PURITAN, a name formerly given in deriſion to the diſſenters from the church of England, on account of their profeſſing to follow the pure word of God, in oppoſition to all traditions and human conſtitutions.

PURLINS, in building, thoſe pieces of timber that lie acroſs the rafters on the inſide, to keep them from ſinking in the middle of their length.

PURLUE, or Purlieu, ſignifies all that ground near any foreſt, which being made foreſt by king Henry II. Richard I. and king John, was afterwards by perambulations and grants of Henry III. ſevered again from the ſame, and made purlieu; that is to ſay, pure and free from the laws of the foreſt.

PURPLE, a colour compoſed of a mixture of red and blue.

A beautiful tranſparent purple for painting may be made by boiling four ounces of raſped braſil-wood in a pint of ſtale beer, and half an ounce of logwood, till the liquor is heightened to the colour you deſire, which may be known by dipping a piece of paper in it. If you find it too red, add a quarter of an ounce more of logwood, which will render it ſtill deeper; and by this method you may bring it to any degree of purple, by putting in either more or leſs logwood to the former compoſition, and fixing it with alum.

PURPURA, in natural hiſtory. See Murex.

PURPURE, or Purple, in heraldry, according to ſome, is one of the five colours of armories, compounded of gules and azure, bordering on violet, and, according to others, of a great deal of red and a little black. But it was excluded by the ancient heralds as only an imperfect colour. In the coats of noblemen it is called amethyſt; and in thoſe of princes, mercury. It is repreſented in engraving, by diagonal lines drawn from the ſiniſter chief to the dexter baſe points. See Plate CXLVII. fig. 3.

PURSER, an officer aboard a man of war, who receives her victuals from the victualler, ſees that it be well ſtowed,

and keeps an account of what he every day delivered to the steward. He also keeps a list of the ship's company, and sets down exactly the day of each man's admission, in order to regulate the quantity of provisions to be delivered out, and that the paymaster or treasurer of the navy may issue out the disbursements, and pay off the men, according to his book.

PURSLAIN, in botany. See PORTULACA.

PURVIEW, a term used by some lawyers for the body of an act of parliament, or that part which begins with, Be it enacted, *&c.* as contradistinguished from the preamble.

PURULENT, in medicine, something mixed with, or partaking of, pus or matter.

PUS, in medicine, a white or yellowish putrid matter, designed by nature for the healing and cementing of wounds or sores.

PUSTULE, a pimple, or small eruption on the skin full of pus; such are the pustules of the small-pox and french-pox. See MEDICINE.

PUTORIUS in zoology. See MUSTELA.

PUTREFACTION. See CHEMISTRY, p. 98.

PUTTY, is a kind of paste, compounded of whiting and linseed oil, beaten together to the consistence of thick dough.

It is used by glaziers for the fastening in the squares of glass in sash-windows, and by painters for stopping up the crevices and clefts in timber and wainscots, *&c.*

PYCNOSTYLE, in the ancient architecture, is a building where the columns stand very close to each other; only one diameter and a half of the column being allowed for the intercolumniations.

PYGARGUS, in ornithology. See FALCO.

PYGMY, a person not exceeding a cubit in height.

This appellation is given by the ancients to a fabulous nation said to have inhabited Thrace; who brought forth young at five years of age, and were old at eight; these were famous for the bloody war they waged with the cranes.

PYLORUS, in anatomy. See ANATOMY, p. 258.

PYRAMID, in geometry, a solid standing on a triangular, square, or polygonal basis, and terminating in a point at the top; or, according to Euclid, it is a solid figure, consisting of several triangles, whose bases are all in the same plane, and have one common vertex.

PYRAMID, in architecture, a solid massive building, which from a square, triangular, or other base, rises diminishing to a vertex or point.

Pyramids are sometimes used to preserve the memory of singular events; and sometimes to transmit to posterity the glory and magnificence of princes. But as they are esteemed a symbol of immortality, they are most commonly used as funeral monuments. Such is that of Cestius at Rome; and those other celebrated ones of Egypt, as famous for the enormity of their size, as their antiquity. These are situated on the west side of the Nile, almost opposite to Grand Cairo: the base of the largest covers more than ten acres of ground; and is, according to some, near seven hundred feet high; though others make it but six hundred, and some but little more than five hundred. The pyramid is said to have been, among the Egyptians, a symbol of human life; the beginning of which is represented by the base, and the end by the apex; on which account it was that they used to erect them over sepulchres.

PYRAMIDALIA CORPORA, in anatomy. See ANATOMY, p. 287.

PYRAMIDALIS, in anatomy. See ANATOMY, p. 193.

PYRENEAN MOUNTAINS divide France from Spain, and are not inferior to the Alps in height: they extend from the Mediterranean to the ocean, upwards of two hundred miles in length, the greatest breadth being about one hundred and twenty.

PYRIFORMIS, in anatomy. See ANATOMY, p. 205.

PYRITES. See CHEMISTRY, p. 117.

PYRMONT, the capital of a county of that name in the circle of Westphalia in Germany, situated on the confines of the duchy of Brunswick, in E. long. 9°, N. lat. 52°, from whence we receive the best mineral waters in Germany.

PYROLA, in botany, a genus of the decandria monogynia class. The calix consists of five segments, and the corolla of five petals; and the capsule has five cells. There are six species, three of them natives of Britain, *viz.* the rotundifolia, or common winter-green; the minor, or lesser winter-green; and the secunda, or dented leaved winter-green.

PYROMANCY, a kind of divination by means of fire. The ancients imagined they could foretel future events, by inspecting fire and flame; and to this end, they considered its direction, which way it turned; sometimes they added other matters to the fire, such as a vessel full of urine, having its neck bound about with wool, watching narrowly on which side it burst, and thence taking their augury: sometimes they threw pitch on it; and, if it took fire immediately, they esteemed it a good augury.

PYROTECHNY, the art of fire, or a science which teaches the management and application of fire in several operations. See CHEMISTRY.

PYROTICS, in medicine, caustics, or remedies, either actually or potentially hot; and which accordingly will burn the flesh, and raise an eschar. See CAUSTICS.

PYRRHICHA, in antiquity, a kind of exercise on horseback, or a feigned combat, for the exercise of the cavalry.

PYRRHICHIUS, in the Greek and Latin poetry, a foot consisting of two syllables, both short; as, *Deus.*

PYRRHONIANS, a sect of ancient philosophers, so called from Pyrrho, a native of Elis, in Peloponnesus. The opinions of these philosophers, who were also called sceptics, terminated in the incomprehensibility of all things, in which they found reason both for affirming and denying; accordingly they seemed, during their whole lives, to be in search of truth, without ever acknowledging that they had found it: hence the art of disputing upon all things, without ever going farther than suspending our judgment, is called pyrrhonism.

PYRUS, in botany, a genus of the icosandria pentagynia class. The calix consists of 5 segments, and the corolla of five petals; the apple has five cells, containing many seeds. There are four species, two of them natives of Britain, *viz.* the communis, or wild pear-tree; and the malus, or crab-apple.

PYTHAGOREANS, a sect of ancient philosophers, so called from their being the followers of Pythagoras of Samos, who lived in the reign of Tarquin the last king of the Romans, in the year of Rome 220; or, according

to Livy, in the reign of Servius Tullius, in the year of the world 3472.

His maxims of morality were admirable; for he was for having the ſtudy of philoſophy ſolely tend to elevate man to a reſemblance of the Deity. He believed that God is a ſoul diffuſed through all nature, and that from him human ſouls are derived; that they are immortal; and that men need only take pains to purge themſelves of their vices, in order to be united to the Deity. He made unity the principle of all things; and believed, that between God and man there are various orders of ſpiritual beings, who are the miniſters of the Supreme Being. He condemned all images of the Deity, and would have him worſhipped with as few ceremonies as poſſible. His diſciples brought all their goods into a common ſtock, contemned the pleaſures of ſenſe, abſtained from ſwearing, eat nothing that had life, and believed in the doctrine of a metempſychoſis. See METEMPSYCHOSIS.

Pythagoras made his ſcholars undergo a ſevere noviciate of ſilence for at leaſt two years; and it is ſaid, that where he diſcerned too great an itch for talking, he extended it to five. His diſciples were therefore divided into two claſſes: of which the firſt were ſimple hearers; and the laſt ſuch as were allowed to propoſe their difficulties, and learn the reaſons of all that was taught there. The Pythagoreans, it is ſaid, on their riſing from bed, rouſed the mind with the ſound of the lyre, in order to make them more fit for the actions of the day; and at night reſumed the lyre, in order to prepare themſelves for ſleep, by calming all their tumultuous thoughts. The figurative manner in which he gave his inſtructions, was borrowed from the Hebrews, Egyptians, and other orientals. Some think he derived his philoſophy from the books of Moſes, and that he converſed with Ezekiel and Daniel at Babylon; but this is mere conjecture.

Some authors ſay, that he left nothing in writing; but Laërtius and others attribute ſeveral treatiſes to him. His golden verſes, attributed by ſome to one of his diſciples, are allowed to be an exact copy of the ſentiments of that divine philoſopher, from whoſe ſchool proceeded the greateſt philoſophers and legiſlators.

PYTHIA, in antiquity, the prieſteſs of Apollo at Delphi, by whom he delivered oracles; ſhe was thus called from the god himſelf, who was denominated Apollo Pythios, from his ſlaying the ſerpent Python.

Q.

QUACK, among phyſicians, the ſame with empiric. See EMPIRIC.

QUADRAGESIMA, a denomination given to lent, from its conſiſting of forty days. See LENT.

QUADRANGLE, in geometry, the ſame with a quadrilateral figure, or one conſiſting of four ſides and four angles.

QUADRANS, the quarter or fourth part of any thing, particularly the *as*, or pound.

QUADRANT, in geometry, the arch of a circle, containing 90°, or the fourth part of the entire periphery.

QUADRANT alſo denotes a mathematical inſtrument, of great uſe in aſtronomy and navigation, for taking the altitudes of the ſun and ſtars. See ASTRONOMY, p. 451.

QUADRAT, a mathematical inſtrument, called alſo a geometrical ſquare, and line of ſhadows: it is frequently an additional member on the face of the common quadrant, as alſo on thoſe of Gunter's and Sutton's quadrant.

QUADRAT, in aſtrology, the ſame with quartile. See QUARTILE.

QUADRAT, in printing, a piece of metal caſt like the letters, to fill up the void ſpaces between words, *&c.* There are quadrats of different ſizes, as m-quadrats, n-quadrats, *&c.* which are, reſpectively, of the dimenſions of theſe letters.

QUADRATIC EQUATION, in algebra. See ALGEBRA, p. 90.

QUADRATRIX, in geometry, a mechanical line, by means whereof we can find right lines equal to the circumference of circles, or other curves, and their ſeveral parts.

QUADRATRIX *of Dinoſtrates*, ſo called from its inventor Dinoſtrates, is a curve, whereby the quadrature of the circle is effected mechanically.

QUADRATURE, in geometry, denotes the ſquaring, or reducing a figure to a ſquare. Thus, the finding of a ſquare, which ſhall contain juſt as much ſurface or area as a circle, an ellipſis, a triangle, *&c.* is the quadrature of a circle, ellipſis, *&c.* See GEOMETRY.

QUADRATURE, in aſtronomy, that aſpect of the moon, when ſhe is 90° diſtant from the ſun. See ASTRONOMY.

QUADRATUS, in anatomy, a name given to ſeveral muſcles on account of their ſquare figure. See ANATOMY, Part II.

QUADREL, in building, a kind of artificial ſtone, ſo called from its being perfectly ſquare.

The quadrels are made of chalky earth, *&c.* and dried in the ſhade for two years. Theſe were formerly in great requeſt among the Italian architects.

QUADRIENNIUM UTILE, in Scots law. See LAW, Tit. vii. 17.

QUADRIGA, in antiquity, a car or chariot drawn by four horſes.

On the reverſes of medals, we frequently ſee the emperor or victory in a quadriga, holding the reins of the horſes; whence theſe coins are, among the curious, called nummi quadrigati, and victoriati.

QUADRILATERAL, in geometry, a figure whoſe perimeter conſiſts of four right lines, making four angles; whence it is alſo called a quadrangular figure.

QUADRILLE, a little troop or company of cavaliers, pompouſly dreſſed, and mounted for the performance of carouſals,

rousals, justs, tournaments, runnings at the ring, and other gallant divertisements.

QUADRILLE, is also a game at cards, to be learned only by practice.

QUADRUPEDS, in zoology. See NATURAL HISTORY.

QUASI CONTRACT, in Scots law. See LAW, Tit xxii. 14.

QUESTUS, in law, signifies whatever a person has by purchase; as hereditas denotes that which one has by descent, or hereditary right.

QUAIL. See TETRAO.

QUAKERS, a religious society that began to be distinguished by this name in England, where it first took its rise, about the middle of the last century.

In treating of this people, we shall deviate from the generality of those who have mentioned them in their writings, by exhibiting the account which they give of themselves, without making ourselves answerable for their principles or their practices.

William Sewel, a Dutchman, published, in the year 1717, the history of this people. He was one of their persuasion, a man of learning, and known to the public by his dictionary of the Dutch and English languages. He had access to all their records, corresponded with the most eminent, lived at the time when the facts he recorded were recent, and we have not heard that any part of his history has been controverted; and as we are informed that it has been published by the approbation of the quakers, we may therefore consider it as an authentic history of their rise, progress, and principal opinions.

George Fox, (for whose birth and parentage, see page 6th of Sewel's History, *&c.*) was the first of this people. He was of a grave, sedate turn from his infancy; always averse to the follies of youth, and desirous of nothing so much as to be preserved in innocence and simplicity. He was early remarked as an example in these respects, and of inflexible integrity. When a youth, he was desirous above all things to please God, and cautiously avoided every thing that either scripture or the dictates of his own conscience taught him to believe were offensive. As he grew up, this disposition increased: it cost him much anxiety, much distress; but at length he was satisfied in respect to many doubts he had admitted, and gained much experience by the things he had suffered. This enabled him to instruct others; and about the year 1647, we find him travelling through several countries in England, seeking out such as had any religious tenderness and exciting the inquiries of many concerning him. Many embraced his opinions; and indeed he seems to have roused the public mind as much as any individual ever did in those countries, for the time and under such circumstances. A man of low birth, without literature, merely by the sanctity of his life, the simplicity of his doctrines, to have collected from all professions, and most ranks, men of character, fortune, and understanding, and embodied them as a religious society; to have instituted one of the best concerted plans of civil discipline; is a circumstance most true, and not unworthy the disquisitions of the ablest philosophers.

The name of *Quaker* was affixed to this people early, by way of reproach. In their assemblies it sometimes happened, that some were so far struck with the remembrance of their past follies and forgetfulness of their condition, others so deeply affected with a sense of God's mercies to them, that they actually trembled and quaked. The nickname so suited the vulgar taste, that it immediately became general. *Friends*, or *the friends of truth*, was the name they were commonly known by to one another; but the epithet abovementioned was stamped upon them by their adversaries, and perhaps indelibly.

The following abstract from the propositions of our countryman, the eminent Barclay, will perhaps exhibit as clear a summary of their opinions as can well be comprised within the limits allowed to this article.

1. The height of all happiness is placed in the true knowledge of God. 2. The true knowledge of God is alone to be obtained by the revelation of the Spirit of God. 3. The revelation of the Spirit of God to the saints has produced the scriptures of truth. 4. From whence it appears, that mankind in general is fallen and degenerated. 5. That God out of his infinite love hath offered universal redemption by Christ, who tasted death for every man. 6. That there is an evangelical and saving light and grace in all. 7. That as many as resist not this light, but receive the same, in them are produced holiness, righteousness, purity, and the fruits which are acceptable to God: 8. Even so as to arrive at a state of freedom from actual sinning and transgressing the law of God; 9. Yet with a possibility of sinning. 10. That as all true knowledge in things spiritual is received by the Spirit of God, so by it every true minister of the gospel is ordained and prepared for the ministry; and as they have freely received, so are they freely to give. 11. That the true worship of God is in spirit and in truth; not limited to place or time, or subject to the intervention of any person; but is to be performed under the moving of the Holy Spirit in our hearts, yet without derogating from the necessity and utility of public united worship, (in which their sufferings and constancy have been most remarkable). 12. That baptism is a pure and spiritual thing, the baptism of the spirit and fire. 13. That the communion of the body and blood of Christ is inward and spiritual. 14. That it is not lawful for any human authority to force the consciences of others on account of difference in worship or opinion, except such opinions tend to the prejudice of his neighbour in his life or estate, or are inconsistent with human society. 15. That as the end of religion is to redeem man from the spirit of this world, and to lead into inward communion with God; therefore all vain customs and habits are to be rejected, which tend to divert the mind from a sense of the fear of God, and that evangelical spirit wherewith Christians ought to be leavened.

Such are the sentiments of this people as proposed to the public by their apologist, who has largely commented on these topics in a work that has passed through no less than eight editions in English, and has been printed in most of the modern languages.

Their particularities of address, language, and behaviour; their declining the use of arms, even in their own defence; their refusing to pay tithes, or contribute to the support of ministers in any shape; likewise their refusing to swear or take an oath on any occasion whatever; have subjected them to much obloquy, and many grievous sufferings. On what principles, and by what arguments, they vindicate themselves from the objections raised against them by their adversaries, may be seen in this elaborate

borate performance. Government has, however, in many instances, extended to this people great indulgencies; convinced, no doubt, by their patient suffering, that their professions of conscientious scruples were sincere, and that nothing dangerous to society could be apprehended from a people who disclaimed the use of arms both offensive and defensive. The œconomy of this society likewise deserves our notice. It appears by their history, that soon after the preaching of George Fox had drawn together in many parts of England considerable bodies of people professing the same opinions, he found it expedient for their better government to establish regular meetings for discipline. The following is, as nearly as we can collect, the plan that is established amongst them.

Where there are any Quakers, they meet together every month, to consider of the necessities of their poor, and to provide for their relief; to hear and determine complaints arising among themselves; to inquire into the conversation of their respective members in regard to morality and conformity to their religious sentiments; to allow the passing of marriages; and to enjoin a strict regard to the peace and good order of the society, the proper education of their young people, and a general attention to the principles and practices of their professions. In every country where there are monthly meetings, a meeting of the like kind is held, and for similar purposes, every quarter. This meeting consists of deputies sent from the several monthly meetings, who are charged with answers in writing to queries proposed to them respecting the good order of the society. At these meetings appeals are received, in case of any disputes; and differences settled, if possible. Advices are given as occasions offer, and assistance afforded to any of the monthly meetings, in case of a larger proportion of poor, or any similar expences. As there are Quakers in most parts of England, there are few counties which have not these quarterly meetings. And from these are deputed 4, 6 or 8 of their members once a-year to their annual assembly at London.

The annual meeting is commonly held in Whitsun-week, not from any superstitious reference, as they say, to the effusion of the Holy Ghost at the time of petecost, but merely as it is a season most generally convenient to the body. At this anniversary meeting, consisting of deputies from every quarterly meeting, and a number of the most judicious of their persuasion in London, selected for the purpose of acting on all emergencies for the good of the society, accounts are received of the state of the society in every part of the world where it exists. The deputies bring with them accounts signed by order of the respective quarterly meetings, informing the yearly meeting, if any disunion appears; if there is any neglect in regard to the religious education of their youth; if the poor are well provided for; if they keep to their testimony against paying tythes, against bearing arms; if they pay the king his duties, customs, and excise, and forbear to deal in goods suspected to be run. Appeals are here received, and finally determined; propositions received, and considered; and rules formed on particular emergencies: And, lastly, such advices are sent to the subordinate meetings as the particular or general state of the society requires.

Perhaps this is the only society in the world that have allowed any share in the management of their affairs to the female sex; which they do upon the principle that male and female are one in Christ. Accordingly we find them in every department of their institution. They have women-preachers, for whom the celebrated Locke made an excellent apology. These have also their meetings of discipline; in which the like care is taken in regard to the female youth, and the good order of their sex, as is done by the men in respect to their own. And when we reflect what a number of individuals of both sexes are kept in good order by the police of this society, how few of them are brought into courts of justice as delinquents, how peaceable their behaviour, and how exemplary their conduct, we cannot but think their principles deserve a more accurate examination than has hitherto been attempted, owing perhaps to the vulgar prejudices circulated against them. We shall close this article with observing, that, according to the best of our information, neither their ministers, nor those who have the principal care of the society, enjoy any pecuniary emolument or advantages. A few clerks only receive salaries for keeping their records; so that perhaps there is not a religious society now existing, where principle has greater influence in promoting the ends of their institution.

It is remarkable, that all the settlements of the Europeans in America, except the Quaker settlement of Pensilvania, were made by force of arms, with very little regard to any prior title in the natives. The kings of Spain, Portugal, France, and Britain, together with the States of Holland, then the only maritime powers, gave grants of such parts of America as their people could lay hold on, studying only to avoid interference with their European neighbours. But Mr Penn, being a Quaker, did not think his powers from king Charles II. a sufficient title to the country since called Pensilvania: He therefore assembled the sachems or princes then in that country, and purchased from them the extent of land that he wanted. The government of this province is mostly in the hands of the Quakers, who never have any quarrels with the natives. When they desire to extend their settlements, they purchase new lands of the sachems, never taking any thing from them by force. How unlike is this conduct to that of the Spaniards, who murdered millions of the natives of Mexico, Terra Firma, Peru, Chili, *&c.* The barbarities used to these poor Indians in conquering their country, and forcing them to discover their gold, are a reproach to human nature.

QUALITY, is defined by Mr Locke, to be the power in a subject of producing any idea in the mind. See METAPHYSICS.

Chemical QUALITIES, those qualities principally introduced by means of chemical experiments, as fumigation, amalgamation, cupellation, volatilization, precipitation, *&c.* See CHEMISTRY.

QUALITY is also used for a kind of title given to certain persons, in regard of their territories, signories, or other pretensions.

QUAMSI, a province of China, bounded by the province of Yunan on the west, by Queycheu on the north, by Quamtum on the east, and by Tonquin on the south.

QUAMTUM, or CANTON, a province of China, bounded by Huguam and Kiamsi on the north, by Foken on the east, by the ocean on the south, and by Quamsi on the west.

QUAN-

QUANTITY, any thing capable of eſtimation, or menſuration; or which, being compared with another thing of the ſame kind, may be ſaid to be greater or leſs than it, equal or unequal to it. See ARITHMETIC, ALGEBRA, GEOMETRY.

QUANTITY, in grammar, an affection of a ſyllable, whereby its meaſure, or the time wherein it is pronounced, is aſcertained; or that which determines the ſyllable to be long or ſhort.

QUARANTINE, is uſed for a term of forty days, which veſſels, coming from places ſuſpected of contagion, are obliged to wait in certain places appointed to air themſelves, before they come into port. See LAZAR-HOUSE.

QUARRY, a place under ground, out of which are got marble, free-ſtone, ſlate, lime-ſtone, or other matters proper for buildings.

QUARRY or QUARREL, among glaziers, a pane of glaſs, cut in a diamond form.

QUART, a meaſure containing the fourth part of ſome other meaſure.

QUARTAN, in medicine, a ſpecies of intermitting fever. See MEDICINE.

QUARTATION, a method of purifying gold, by melting three parts of ſilver with one of gold, and then throwing the mixture into aqua-fortis. See CHEMISTRY, p. 129.

QUARTER, the fourth part of any thing.

Quarter, in weights, is generally uſed for the fourth part of an hundred weight averdupois, or 28 ℔.

Uſed as the name of a dry meaſure, quarter is the fourth part of a ton in weight, or eight buſhels.

QUARTER, in aſtronomy, the fourth part of the moon's period.

QUARTER, in heraldry, is applied to the parts or members of the firſt diviſion of a coat that is quartered, or divided into four quarters. See QUARTERING.

Franc-QUARTER, in heraldry, is a quarter ſingle or alone; which is to poſſeſs one fourth part of the field.

This makes one of the honourable ordinaries of a coat.

QUARTER-MASTERS, or QUARTEERS, in a man of war, are officers whoſe buſineſs it is to rummage, ſtow, and trim the ſhip in the hold; to overlook the ſteward in his delivery of victuals to the cook, and in pumping or drawing out beer, or the like. They are alſo to keep their watch duly, in conning the ſhip, or any other duty.

QUARTER-MASTER, an officer in the army, whoſe buſineſs is to look after the quarters of the ſoldiers; of which there are ſeveral kinds, *viz.* The quarter-maſter general, whoſe buſineſs is to provide good quarters for the whole army; quarter-maſter of horſe, he who is to provide quarters for a troop of horſe; quarter-maſter of foot, he who is to provide quarters for a regiment of foot.

QUARTERING, in the ſea language, is diſpoſing the ſhip's company at an engagement, in ſuch a manner as that each may readily know where his ſtation is, and what he is to do.

QUARTERING, in heraldry, is dividing a coat into four or more quarters or quarterings, by parting, couping, *&c.* that is, by perpendicular and horizontal lines, *&c.*

QUATUOR-VIR, in antiquity, formerly written IIII. VIR, a Roman magiſtrate who had three colleges joined with him in the ſame adminiſtration, and had the care of conducting and ſettling the colonies ſent into the provinces.

There were alſo quatuor-viri appointed to inſpect and take care of repairs, *&c.*

QUAVER, in muſic, a meaſure of time equal to half a crotchet, or an eighth of a ſemibreve. See MUSICK.

QUEBEC, the capital of Canada, in North America, ſituated on the weſt ſide of the river of St Lawrence, 300 miles north-weſt of Boſton in New England: W. long. 74°, N. lat. 47° 35′.

QUEEN, a woman who holds a crown ſingly.

The title of queen is alſo given by way of courteſy to her that is married to a king, who is called by way of diſtinction queen-conſort; the former being termed queen-regent. The widow of a king is alſo called queen, but with the addition of dowager.

QUEEN'S-COUNTY, a county of Ireland, bounded by King's-county, on the north; by Kildare, on the eaſt; by Kilkenny, on the ſouth; and by the province of Munſter, on the weſt.

QUEEN'S FERRY, a town of Scotland, on the ſouth ſide of the river Forth, ten miles weſt of Edinburgh.

QUEENBOROUGH, a borough town of the iſle of Sheppy, in Kent, twelve miles north-weſt of Canterbury. It ſends two members to parliament.

QUERCUS, in botany, a genus of the monœcia polyandria claſs. The calix of the male has five ſegments; it has no corolla; and the ſtamina are from five to ten. The calix of the female is one entire, rough leaf; it has no corolla; the ſtyli are from two to five; and the ſeed is ovated. There are 14 ſpecies, only one of them, *viz.* the robur, or common oak, a native of Britain.

QUERCY, the ſouth-eaſt diviſion of the province of Guienne, in France, have Limoſin on the north, and Languedoc on the ſouth.

QUERIA, in botany, a genus of the triandria trigynia claſs. The calix conſiſts of five leaves; it has no corolla; and the capſule has one cell and one ſeed. There are two ſpecies, none of them natives of Britain.

QUESTION, in logic, a propoſition propoſed by way of interrogation. See LOGIC.

QUESTOR, in Roman antiquity, an officer who had the management of the public treaſure.

The queſtorſhip was the firſt office any perſon could bear in the commonwealth, and gave a right to ſit in the ſenate.

At firſt there were only two; but afterwards two others were created, to take care of the payment of the armies abroad, of the ſelling plunder, booty, *&c.* for which purpoſe they generally accompanied the conſuls in their expeditions; on which account they were called peregrini, as the firſt and principal two were called urbani.

The number of queſtors was afterwards greatly increaſed. They had the keeping of the decrees of the ſenate: and hence came the two offices of queſtor principis, or auguſti, ſometimes called candidatus principis, whoſe office reſembled in moſt reſpects that of our ſecretaries of ſtate; and the quæſtor palatii, anſwering in a great meaſure to our lord chancellor.

QUEUE, in heraldry, ſignifies the tail of a beaſt: thus if a lion be borne with a forked tail, he is blazoned double queued.

QUICK, or QUICKSET HEDGE, among gardeners, denotes all live hedges of whatever ſort of plants they are compoſed, to diſtinguiſh them from dead hedges: but in a

more ſtrict ſenſe of the word, it is reſtrained to thoſe planted with the hawthorn, under which name theſe young plants, or ſets, are ſold by the nurſery-gardeners who raiſe them for ſale.

QUICKSILVER. See CHEMISTRY, p. 85.

QUIETISTS, a religious ſect, which made a great noiſe towards the cloſe of the laſt century.

They were ſo called from a kind of abſolute reſt and inaction, which they ſuppoſed the ſoul to be in when arrived at that ſtate of perfection which they called the unitive life; in which ſtate, they imagined the ſoul wholly employed in contemplating its God, to whoſe influence it was entirely ſubmiſſive, ſo that he could turn and drive it where and how he would. In this ſtate, the ſoul no longer needs prayers, hymns, *&c.* being laid, as it were, in the boſom, and between the arms of its God, in whom it is in a manner ſwallowed up.

The Mahometans ſeem to be no ſtrangers to quietiſm. They expound a paſſage in the ſeventieth chapter of the Koran, viz. *O thou ſoul, which art at reſt, return unto thy Lord*, &c. of a ſoul, which having, by purſuing the concatenation of natural cauſes, raiſed itſelf to the knowledge of that Being which produced them, and exiſts of neceſſity, reſts fully contented, and aquieſces in the knowledge, *&c.* of him, and in the contemplation of his perfections.

QUILLS, the large feathers taken out of the end of the wing of a gooſe, crow, *&c.*

Quills are denominated from the order in which they are fixed in the wing, the ſecond and third quills being the beſt for writing, as they have the largeſt and roundeſt barrels.

In order to harden a quill that is ſoft, thruſt the barrel into hot aſhes, ſtirring it till it is ſoft; then taking it out, preſs it almoſt flat upon your knee with the back of a penknife, and afterwards reduce it to a roundneſs with your fingers. If you have a number to harden, ſet water and alum over the fire; and while it is boiling put in a handful of quills, the barrels only, for a minute, and then lay them by.

QUINCE, in botany. See PYRUS.

QUINCUNX, in Roman antiquity, denotes any thing that conſiſts of five twelfth-parts of another, but particularly of the as.

QUINDECAGON, in geometry, a plain figure with fifteen ſides and fifteen angles.

QUINDECEMVIRI, in Roman antiquity, a college of 15 magiſtrates, whoſe buſineſs it was to preſide over the ſacrifices.

They were alſo the interpreters of the Sibyl's books; which, however, they never conſulted but by an expreſs order of the ſenate

QUINQUAGENARIUS, in Roman antiquity, an officer who had the command of fifty men.

QUINQUAGESIMA SUNDAY, Shrove Sunday, ſo called as being about the fiftieth day before Eaſter.

QUINQUATRIA, in Roman antiquity, feſtivals celebrated in honour of Minerva, with much the ſame ceremonies as the panathenæa were at Athens.

QUINQUEFOLIUM, in botany. See POTENTILLA.

QUINQUENNALIS, in Roman antiquity, a magiſtrate in the colonies and municipal cities of that empire, who had much the ſame office as the ædile at Rome.

QUINQUEREMIS, in antiquity, a galley with five rows of oars.

QUINQUEVIRI, in Roman antiquity, an order of five prieſts, peculiarly appointed for the ſacrifices to the dead, or celebrating the rites of Erebus.

QUINQUINA. See CINCHONA.

QUINTESSENCE, in chemiſtry, a preparation conſiſting of the eſſential oil of ſome vegetable ſubſtance mixed and incorporated with ſpirit of wine.

QUINTESSENCE, in alchemy, is a myſterious term, ſignifying the fifth, or laſt and higheſt eſſence of power or a natural body.

QUINTILE, in aſtronomy, an aſpect of the planets, when they are 72 degrees diſtant from one another, or a fifth part of the zodiac.

QUINTILIANS, a ſect of ancient heretics, thus called from their propheteſs Quintilia. In this ſect the women were admitted to perform the ſacerdotal and epiſcopal functions. They attributed extraordinary gifts to Eve for having firſt eaten of the tree of knowledge; told great things of Miriam the ſiſter of Moſes, as having been a propheteſs, *&c.* They added that Philip the deacon had four daughters who were all propheteſſes, and were of their ſect. In theſe aſſemblies it was uſual to ſee the virgins entering in white robes, perſonating propheteſſes.

QUINZY, QUINSEY, or ANGLINA. See MEDICINE, p. 84.

QUIRE of paper, the quantity of 24 or 25 ſheets.

QUIRINALIA, in antiquity, a feaſt celebrated among the Romans in honour of Romulus, who was called Quirinus. Theſe feaſts were held on the 13th of the kalends of March.

QUIRITES, in antiquity, a name given to the people of Rome, chiefly the common citizens, as diſtinguiſhed from the ſoldiery.

QUOIN, or COIN, on board a ſhip, a wedge faſtened on the deck cloſe to the breech of the carriage of a gun, to keep it firm up to the ſhip-ſide.

Cantic quoins are ſhort three-legged quoins put between caſks to keep them ſteady.

QUOINS, in architecture, denote the corners of brick or ſtone walls. The word is particularly uſed for the ſtones in the corners of brick-buildings. When theſe ſtand out beyond the brick-work, their edges being chamfered off, they are called ruſtic quoins.

QUOTIDIAN, in medicine. See MEDICINE, p. 62.

QUOTIENT, in arithmetic. See ARITHMETIC, p. 376.

R.

RAAB, a city of Lower Hungary, ſituated at the confluence of the rivers Danube and Raab, and ſubject to the houſe of Auſtria: E. long. 18°, N. lat. 48°.

RABBI, or RABBINS, a title which the phariſees and doctors

tors of the law among the Jews assumed, and literally signifies masters, or excellents.

There were several gradations before they arrived at the dignity of a rabbin, which was not conferred till they had acquired the profoundest knowledge of the law and the traditions. It does not however appear, that there was any fixed age, or previous examination necessary; but when a man had distinguished himself by his skill in the written and oral law, and passed through the subordinate degrees, he was saluted a rabbin by the public voice.

Among the modern Jews, for near seven hundred years past, the learned men retain no other title than that of rabbi, or rabbins; they have great respect paid them, have the first places or seats in their synagogues, determine all matters of controversy, and frequently pronounce upon civil affairs; they have even a power to excommunicate the disobedient.

RABBIT, in zoology. See Lepus.

RACE, in general, signifies running with others in order to obtain a prize, either on foot, or by riding on horseback, in chariots, *&c.*

Race, in genealogy, a lineage or extraction continued from father to son.

RACHITIS, the Rickets. See Medicine, p. 169.

RACK, an engine of torture, furnished with pullies and cords, *&c.* for extorting confession from criminals.

Rack, a spirituous liquor made by the Tartars of Tongusia. This kind of rack is made of mare's milk, which is left to be sour, and afterwards distilled twice or thrice between two earthen pots closely stopped, from whence the liquor runs through a small wooden pipe. This liquor is more intoxicating than brandy distilled from wine.

Rack is also a spirituous liquor which the English get from Batavia or Malacca, of which there are three sorts, the one being extracted from the cocoa-tree, the second from rice, and the third from sugar: but the first is the best and most in use. It is made of the blossom-bunch of the cocoa-tree: for which purpose they tie the bunch, while it is still wrapped up within its cod, or membrane, with a piece of packthread; and then with a knife make a cross cut in that bunch, a little above the place where it is tied, and adapt a pitcher to it to receive the liquor, which is called toddy, and is vinous, palatable, and sweet: others use a bamboe-cane instead of a pitcher. Having thus drawn the liquor, they let it ferment, and afterwards distil it.

To Rack *wines*, &c. to draw them off from their lees, after their having stood long enough to clear and settle.

Hence rack-vintage is frequently used for the second voyage our wine-merchants used to make into France for racked-wines.

RACKOON, in zoology. See Viverra.

RADIALIS, in anatomy. See Anatomy, p. 198.

RADIANT, in optics, is any point of a visible object from whence rays proceed. See Optics.

RADIATED flowers, in botany, are such as have several semi-floscules set round a disk, in form of a radiant star; those which have no such rays are called discous flowers.

RADIATION, the act of a body emitting or diffusing rays of light all round, as from a centre. See Optics.

RADICAL, in general, something that serves as a basis or foundation.

Hence physicians talk much of a radical moisture.

In grammar, we give the appellation radical to primitive words, in contradistinction to compounds and derivatives.

Algebraists also speak of the radical sign of quantities, which is the character expressing their roots.

RADICLE, that part of the seeds of all plants, which upon vegetating becomes its root, and is discoverable by the microscope. See Agriculture, p. 41.

RADISH, in botany. See Raphanus.

RADIUS, in geometry, the semi-diameter of a circle, or a right line drawn from the centre to the circumference.

Radius, in anatomy. See Anatomy, p. 179.

RADIX. See Root.

RADNOR, the capital of the county of Radnor in Wales, situated in W. long. 3° 6′, N. lat. 52° 20′.

RAFTERS, in building, are pieces of timber, which standing by pairs on the raison or raising piece, meet in an angle at the top, and form the roof of a building. See Architecture.

RAGOUT, a sauce, or seasoning, intended to rouse the appetite when lost or languishing.

RAGULED, or Ragged, in heraldry, jagged or knotted. This term is applied to a cross formed of the trunks of two trees without their branches, of which they shew only the stumps. See Plate CXLVII. fig. 5.

Raguled differs from indented, in that the latter is regular, the former not.

RAJA, the title of the Indian black princes, the remains of those who ruled there before the Moguls. Some of the rajas are said to preserve their independency, especially in the mountainous parts; but most of them pay an annual tribute to the Mogul.

Raja, in ichthyology, a genus belonging to the order of amphibia nantes. There are five spiracula below towards the peak; the body is compressed; and the mouth is situate under the head. There are nine species, one of which is the torpedo, or cramp-fish, found in the Mediterranean and Persian Gulph. When touched, it defends itself by a tremulous motion, which benumbs any animal which attempts to injure it.

RAJANIA, in botany, a genus of the diœcia hexandria class. The calix of both male and female consists of six segments; none of them have any corolla; the female has three styli; the fruit is roundish, with an oblique wing. There are three species, none of them natives of Britain.

RAIL, in ornithology. See Rallus.

RAIN, water which descends from the clouds in form of drops of water.

Rain is apparently the precipitated vapours of watery clouds: thus, when various congeries of clouds are driven together by the agitation of the winds, they mix and run into one body, and by that means dissolve and condense each other into their former substance of water: also the coldness of the air is a great means to collect, compact, and condense clouds into water; which being heavier than the air, must of necessity fall through it in the form we call rain. Now the reason why it falls in drops and not in whole quantities, as it becomes condensed, is the resistance of the air; whereby being broken and divided into smaller and smaller parts the farther it passes through the air, it at last arrives to us in small drops.

Mr.

Mr. Derham accounts for the precipitation hence, that the vesiculæ being full of air, when they meet with a colder air than that they contain, their air is contracted into a less space; and consequently the watery shell rendered thicker, so as to become heavier than the air, &c.

Others only allow the cold a part in the action, and bring in the winds as sharers with it: indeed, it is plain, that a wind, blowing against a cloud, will drive its vesiculæ upon one another, by which means several of them coallescing, will be enabled to descend; and the effect will be still more considerable if two opposite winds blow towards the same place. Add to this, that clouds already formed, happening to be aggravated by fresh accessions of vapour continually ascending, may thence be enabled to descend.

According to Rohault, the great cause of rain is the heat of the air; which, after continuing for some time near the earth, is at length carried up on high by a wind, and there thawing the snowy villi, or flocks of the half frozen vesiculæ, reduces them into drops; which, coallescing, descend.

Others, as Dr. Clarke, &c. ascribe this descent of the clouds rather to an alteration of the atmosphere than of the vesiculæ; and suppose it to arise from a diminution of the elastic force of the air. This elasticity, which depends chiefly or wholly on the terrene exhalations, being weakened, the atmosphere sinks under its burden, and the clouds fall.

Now the little vesicles, being once upon the descent, will persist therein, notwithstanding the increase of resistance they every moment meet with. For as they all tend toward the centre of the earth, the farther they fall, the more coalitions will they make; and the more coalitions, the more matter will there be under the same surface; the surface only increasing as the squares, but the solidity as the cubes; and the more matter under the same surface, the less resistance there will be to the same matter. Thus, if the cold, wind, &c. act early enough to precipitate the ascending vesicles, before they are arrived at any considerable height, the coalitions being but few, the drops will be proportionably small; and thus is formed a dew. If the vapours be more copious, and rise a little higher, we have a mist or fog. A little higher still, and they produce a small rain, &c. If they neither meet with cold nor wind, they form a heavy, thick, dark sky.

Hence, many of the phænomena of the weather may be accounted for: as, why a cold summer is always a wet one, and a warm a dry one; why we have commonly most rain about the equinoxes; why a settled, thick, close sky scarce ever rains, till it have been first clear. As to the quantity of rain that falls, its proportion in several places at the same time, and in the same place at several times, we have store of observations, journals, &c. in the memoirs of the French Academy, Philosophical Transactions, &c.

RAINBOW. See OPTICS, p. 435, &c.

Lunar RAINBOW. The moon sometimes also exhibits the phænomenon of an iris, by the refraction of her rays in drops of rain in the night-time.

Aristotle says, he was the first that ever observed it; and adds, that it is never visible but at the time of full moon.

The lunar iris has all the colours of the solar, only fainter.

Marine RAINBOW, the sea-bow, is a phænomenon sometimes observed in a much agitated sea, when the wind, sweeping part of the tops of the waves, carries them aloft; so that the rays of the sun are refracted, &c. as in a common shower.

RAISINS, grapes prepared by suffering them to remain on the vine till they are perfectly ripe, and then drying them in the sun, or by the heat of an oven. The difference between raisins dried in the sun, and those dried in ovens, is very obvious: the former are sweet and pleasant, but the latter have a latent acidity with the sweetness that renders them much less agreeable.

RAKE *of a ship* is all that part of her hull which hangs over both ends of her keel. That which is before, is called the fore-rake, or rake-forward; and that part which is at the setting on of the stern post, is called the rake aft, or afterward.

RALLUS, in ornithology, a genus belonging to the order of grallæ. The beak is thickest at the base, compressed, equal, acute, and somewhat sharp on the back near the point; the nostrils are oval; the feet have four toes, without any web; and the body is compressed. There are ten species, principally distinguished by their colour.

RAM, in zoology. See OVIS.

RAM, in astronomy. See ASTRONOMY.

Battering RAM, in antiquity, a military engine used to batter and beat down the walls of places besieged.

The battering ram was of two sorts; the one rude and plain, the other compound. The former seems to have been no more than a great beam which the soldiers bore on their arms and shoulders, and with one end of it by main force assailed the wall. The compound ram is thus described by Josephus: it is a vast beam, like the mast of a ship, strengthened at one end with a head of iron, something resembling that of a ram, whence it took its name.

This was hung by the middle with ropes to another beam, which lay across two posts; and hanging thus equally balanced, it was by a great number of men drawn backwards and pushed forwards, striking the wall with its iron-head.

Plutarch informs us, that Marc Anthony, in the Parthian war, made use of a ram fourscore feet long: and Vitruvius tells us, that they were sometimes an hundred and six, and sometimes an hundred and twenty feet in length; and to this perhaps the force and strength of the engine was in a great measure owing. The ram was managed at one time by a whole century of soldiers; and they being spent, were seconded by another century, so that it played continually without any intermission.

RAM'S HEAD, in a ship, is a great block belonging to the fore and main-halliards. It has three shivers in it, into which the halliards are put, and in a hole at the end of it are reeved the ties.

RAMADAN, a solemn season of fasting among the Mahometans. See MAHOMETANISM.

RAMIFICATION, the production of boughs or branches, or of figures resembling branches.

RAMMER, an instrument used for driving down stones or piles into the ground; or for beating the earth, in order to render it more solid for a foundation.

RAMMER *of a gun*, the gun-stick; a rod used in charging of a gun, to drive home the powder, as also the shot and the

the wad, which keeps the ſhot from rolling out. See GUNNERY.

RAMPANT, in heraldry, a term applied to a lion, leopard, or other beaſt that ſtands on his hind-legs, and rears up his forefeet in the poſture of climbing, ſhewing only half his face, as one eye, *&c.* It is different from ſaliant, in which the beaſt ſeems ſpringing forward as if making a ſally. See Plate CXLVII. fig. 6.

RAMPART, in fortification, is an elevation of earth round a place capable of reſiſting the cannon of an enemy; and formed into baſtions, curtins, *&c.* See FORTIFICATION.

RAMSEY, an iſland in the Iriſh channel, on the coaſt of Pembrokeſhire: W. long 5° 20', N. lat. 51° 55'.

RAMUS, in general, denotes a branch of any thing, as of a tree, an artery, vein, *&c.*

RANA, the FROG, in zoology, a genus belonging to the claſs of amphibia reptilia. The body is naked, furniſhed with four feet, and without any tail. There are 17 ſpecies. Frogs undergo a very ſtrange metamorphoſis. When they firſt iſſue from the eggs, they appear in a roundiſh form, with a long tail, and are then denominated tadpolls. After continuing in this ſtate for ſeveral weeks, the tail begins to mortify and fall off gradually, the feet at the ſame time ſpringing as gradually out of the body, till they aſſume the complete form of frogs.

RANCHIERA, a port-town of Terra Firma, ſituated in W. long. 72°, N. lat. 11° 34'.

RANCID, denotes a fatty ſubſtance that is become rank or muſty, or has contracted an ill ſmell by being kept cloſe.

RANGE, in gunnery, the path of a bullet, or the line it deſcribes from the mouth of the piece to the point where it lodges See GUNNERY.

RANGIFER, the RAIN-DEER. See CORVUS,

RANK, the order or place allotted a perſon, ſuitable to his quality or merit.

RANKING OF CREDITORS, in Scots law. See LAW, Tit. xix. 13.

RANSOM, a ſum of money paid for the redemption of a ſlave, or for the liberty of a priſoner of war. In our law-books, ranſom is alſo uſed for a ſum paid for the pardon of ſome great offence, and to obtain the offender's liberty.

RANULA, a tumour under the tongue, which like a ligature hinders a child from ſpeaking or ſucking.

RANUNCULUS, in botany, a genus of the polyandria polygynia claſs. The calix conſiſts of five leaves, and the corolla of five petals, with a melliferous pore in the claw of each; and the ſeeds are naked. There are 38 ſpecies, 11 of them natives of Britain.

RAOLCONDA, a city of the hither India, ſituated in the province of Golconda: E. long. 79°, N. lat. 17° 12'.

RAPACIOUS ANIMALS, are ſuch as live upon prey.

RAPE, in law, the having carnal knowledge of a woman by force and againſt her will. See LAW, Tit. xxxiii. 26.

RAPHANUS, in botany, a genus of the tetradynamia ſiliquoſa claſs. The calix is ſhut; the pod is cylindrical, and ſubarticulated; there are two melliferous glands between the ſhort ſtamina and the piſtillum, and as many between the long ſtamina and calix. There are three ſpecies, only one of them, *viz.* the raphoniſtrum, charlock, a native of Britain.

RAPHIDIA, in zoology, a genus of inſects belonging to the order of neuroptera. The head is depreſſed and horny; it has two teeth, four pappi, and three ſtemmata; the wings are deflected; the feelers are cylindrical, and of the length of the thorax; and the tail of the female is furniſhed with a lax bended briſtle. There are three ſpecies.

RAPIER, formerly ſignified a long old-faſhioned broad ſword, ſuch as thoſe worn by the common ſoldiers: but it now denotes a ſmall ſword, as contradiſtinguiſhed from a back-ſword.

RAPINE, in law, the taking away another's goods, *&c.* openly and by violence.

RAPPAHANOCK, a large navigable river which riſes in the mountains weſt of Virginia, and diſcharges itſelf into the bay of Cheſepeak.

RAPTURE, an ecſtaſy, or tranſport of mind. See ECSTASY.

RARE, in phyſics, ſtands oppoſed to denſe; and denotes a body that is very porous, whoſe parts are at a great diſtance from one another, and which contains but little matter under a large bulk.

RAREFACTION, in phyſics, the act whereby a body is rendered rare; that is, brought to poſſeſs more room, or appear under a larger bulk without acceſſion of any new matter.

RASEBURG, a port town of Sweden, in the province of Finland, and territory of Nyland, ſituated on the gulph of Finland: E. long. 23°, N. lat 60° 22'.

RASTAT, the name of two towns of Germany; one in the circle of Bavaria and archbiſhopric of Saltzburg, ſituated on the river Ens, thirty-five miles ſouth of the city Ens; another in the circle of Swabia and marquiſate of Baden, ſituated on the eaſt ſide of the river Rhine, twenty-one miles ſouth-weſt of Philipſburg.

RAT, in zoology. See MUS.

RAT-TAILS, or ARRESTS, in the manege, ſignify hard callous ſwellings upon the hinder legs under the hough, running along the ſinew.

A horſe is called rat-tail, when he has no hair upon his tail.

RATAFIA, a fine ſpirituous liquor, prepared from the kernels, *&c.* of ſeveral kinds of fruits, particularly of cherries and apricots.

Ratafia of cherries is prepared by bruiſing the cherries, and putting them into a veſſel wherein brandy has been long kept; then adding to them the kernels of cherries, with ſtraw-berries, ſugar, cinnamon, white pepper, nutmeg, cloves; and to twenty pound of cherries, ten quarts of brandy. The veſſel is left open ten or twelve days, and then ſtopped cloſe for two months before it be tapped. Ratafia of apricots is prepared two ways, *viz.* either by boiling the apricots in white wine, adding to the liquor an equal quantity of brandy, with ſugar, cinnamon, mace, and the kernels of apricots; infuſing the whole for eight or ten days; then ſtraining the liquor, and putting it up for uſe: Or elſe by infuſing the apricots cut in pieces in brandy, for a day or two, paſſing it through a ſtraining bag, and then putting in the uſual ingredients.

RATCH, or RASH, in clock-work, a ſort of wheel having twelve fangs, which ſerve to lift up the detents every hour, and make the clock ſtrike. See WATCH.

RATCHETS, in a watch, are the ſmall teeth at the bot-

tom of the fusy, or barrel, which ſtops it in winding up.

RATE, a ſtandard or proportion, by which either the quantity or value of a thing is adjuſted.

RATE *of a ſhip of war*, is its order, degree, or diſtinction, as to magnitude, burden, *&c.*

RATEEN, in commerce, a thick woollen ſtuff, quilted, woven on a loom with four treddles, like ſerges, and other ſtuffs, that have the whale or quilling. There are ſome rateens dreſſed and prepared like cloths; others left ſimply in the hair; and others where the hair or knap is frized. Rateens are chiefly manufactured in France, Holland, and Italy, and are moſtly uſed in linings. The frize is a ſort of coarſe rateen, and the drugget is a rateen half linnen half woolen.

RATIFICATION, an act approving off, and confirming ſomething done by another in our name.

RATIO, in arithmetic and geometry, is that relation of homogeneous things which determines the quantity of one from the quantity of another, without the intervention of a third. See ARITHMETICK, ALGEBRA, and GEOMETRY.

RATIOCINATION, the act of reaſoning. See REASONING.

RATION, in the army, a portion of ammunition, bread, drink, and forage, diſtributed to each ſoldier in the army, for his daily ſubſiſtence, *&c.* The horſe have rations of hay and oats, when they cannot go out to forage. The rations of bread are regulated by weight. The ordinary ration of a foot-ſoldier is a pound and a half of bread per day. The officers have ſeveral rations according to their quality and the number of attendants that they are obliged to keep. When the ration is augmented on occaſions of rejoicing, it is called a double ration. The ſhips crews have alſo their rations or allowances of biſcuit, pulſe, and water, proportioned according to their ſtock.

RATIONAL, *reaſonable.* See REASON.

RATIONAL, is alſo applied to integral, fractional, and mixt numbers: thus we ſay rational fraction, rational integer, and rational mixt number.

RATIONALE, a ſolution or account of the principles of ſome opinion, action, hypotheſis, phænomenon, or the like.

RATIPOR, a town of Bohemia, in the duchy of Sileſia, ſituated on the river Oder, ſixteen miles north-eaſt of Tropaw.

RATIPOR, is alſo a city of hither India, capital of the province of Malva, ſituated E. long 80°. N lat 25°.

RATISBON, a city of Germany, in the circle of Bavaria, ſituated at the confluence of the rivers Danube and Regen, in E. long. 12° 5′, N. lat. 49°. This is a free imperial city, and here the aſſembly or diet of the ſtates of the empire meets.

RATLINES, or, as the ſeamen call them, RATLINS, thoſe lines which make the ladder ſteps to go up the ſhrouds and puttocks, hence called the ratlins of the ſhrouds.

RATTLE SNAKE, See CROTALUS.

RATTLE-SNAKE ROOT. See POLYGALA.

RAVA, a city of Great Poland, capital of the Palatinate of Rava, ſituated fifty miles ſouth eaſt of Warſaw.

RAVELIN, in fortification, was anciently a flat baſtion, placed in the middle of a curtin; but now a detached work compoſed only of two faces, which make a ſaliant angle, without any flanks, and raiſed before the curtin on the counterſcarp of the place. See FORTIFICATION.

RAVEN, in ornithology. See CORVUS.

RAVENGLAS, a port-town of Cumberland, ſituated on the Iriſh Channel, thirty-eight miles ſouth-weſt of Carliſle.

RAVENNA, a city of Italy, in the pope's territories, capital of the province of Romania, ſituated E. lon. 13°, N. lat. 44° 30′.

RAUVOLFIA, in botany, a genus of the pentandria monogynia claſs. The berry contains two ſeeds. There are two ſpecies; both natives of America.

RAY, in optics, a beam of light, emitted from a radiant or luminous body. See OPTICS.

RAYLEIGH, a market-town of Eſſex, ten miles ſouth-eaſt of Chelmsford.

RAYONANT, or *Croſs* RAYONANT, in heraldry, one which has rays of glory behind it, darting out from the centre to all the quarters of the eſcutcheon, as repreſented in Plate CXLVII. fig. 7.

RAZOR, a well known inſtrument uſed by ſurgeons, barbers, *&c.* for ſhaving off the hair from various parts of the body.

RAZOR-BILL, in ornithology. See ALCA.

RE-ACTION, in phyſiology, the reſiſtance made by all bodies to the action or impulſe of others that endeavour to change its ſtate whether of motion or reſt. See MECHANICS.

READING, a borough town in Berkſhire, ſituated forty miles weſt of London, near the confluence of the river Kenet and Thames; it ſends two members to parliament.

REAL, is applied to a being that actually exiſts; in which ſenſe, it coincides with actual.

REAL, or CHIAPA, a city of Mexico, in North America, capital of the province of Chiapa, ſituated W. lon. 95°, N lat 17°.

REALEJO, a port-town of Mexico, in the province of Nicaragua, ſituated on the bay of the Pacific Ocean, in W. long. 91° 30′, N lat 12°.

REALISTS, a ſect of ſchool philoſophers, formed in oppoſition to the nominaliſts. See NOMINALISTS.

Under the Realiſts are included the Scotiſts, Thomiſts, and all excepting the followers of Ocham. Their diſtinguiſhing tenet is, that univerſals are realities, and have an actual exiſtence out of an idea or imagination, or, as they expreſs it in the ſchools, *a parte rei*; whereas the nominaliſts contend, that they exiſt only in the mind, and are only ideas, or manners of conceiving things.

REALITY, in the ſchools, a diminutive of *res*, thing, firſt uſed by the Scotiſts, to denote a thing which may exiſt of itſelf; or which has a full and abſolute being of itſelf, and is not conſidered as a part of any other.

REALM, a country which gives its head, or governor, the denomination of a king.

REALMONT, a town of France, in the province of Languedoc, ſituated thirty-two miles north-eaſt of Thouloſe.

REAR, a term frequently uſed in compoſition, to denote ſomething behind or backwards, in reſpect of another, in oppoſition to van: thus, in a military ſenſe, it is uſed for the hind part of an army, in oppoſition to the front.

REASON, a faculty or power of the mind, whereby it diſtin-

distinguishes good from evil, truth from falsehood, *&c.* See LOGIC and METAPHYSICS.

REASONING, RATIOCINATION, the exercise of the faculty of the mind called reason; or it is an act or operation of the mind, deducing some unknown proposition from other previous ones that are evident and known. See LOGIC, and METAPHYSICS.

REBATE, or REBATEMENT, in commerce, a term much used at Amsterdam, for an abatement in the price of several commodities, when the buyer instead of taking time advances ready money.

REBATEMENT, in heraldry, a diminution or abatement of the bearings in a coat of arms.

REBEL, a town of Germany, in the duchy of Mecklenburgh, thirty-two miles south-east of Gustrow.

REBELLION, a traiterous taking up of arms against the king by his own natural subjects, or those formerly subdued.

REBUS, in ænigmatical representation of some name, *&c.* by using figures or pictures instead of words, or parts of words. Camden mentions an instance of this absurd kind of wit in a gallant, who expressed his love to a woman, named Rose Hill, by painting in the border of his gown a *rose*, a *hill*, an *eye*, a *loaf*, and a *well*; which, in the style of the rebus, reads, *Rose Hill, I love well*. This kind of wit was long practised by the great, who took the pains to find devices for their names. It was, however, happily ridiculed by Ben Johnson, in the humourous description of Abel Drugger's device, in the Alchemist; and by the Spectator, in the device of Jack of Newberry; at which time the rebus, being raised to sign-posts, was grown out of fashion at court.

REBUTTER, in law, the defendant's answer to the plantiff's surrejoinder, in a cause depending in the court of chancery, *&c.*

RECAPITULATION, is a summary, or a concise and transient enumeration of the principal things insisted on in the preceding discourse, whereby the force of the whole is collected into one view.

RECEIVER, in pneumatics, a glass-vessel for containing the thing on which an experiment in the air-pump is to be made. See PNEUMATICS.

RECEPTACULUM CHYLI. See ANATOMY, p. 282.

RECHABITES, a kind of religious order among the ancient Jews instituted by Jonadab the son of Rechab, comprehending only his own family and posterity.

Their founder prescribed them three things: first, not to drink any wine; secondly, not to build any houses, but to dwell in tents; and thirdly, not to sow any corn, or plant vines. These rules the Rechabites observed with great strictness.

RECIPE, in medicine, a prescription or remedy, to be taken by a patient; so called because always beginning with the word *recipe*, i. e. *take*; which is generally denoted by the abbreviature ℞.

RECIPIENT, the same with receiver.

RECIPROCAL, in general, something that is mutual, or which is returned equally on both sides, or that affects both parties alike.

RECIPROCAL TERMS, among logicians, are those which have the same signification; and consequently are convertible, or may be used for each other.

RECIPROCAL FIGURES, in geometry, those which have the antecedents and consequents of the same ratio in both figures. See GEOMETRY.

RECITATIVO, in musick, a kind of singing that differs but little from ordinary pronunciation, such as that in which the several parts of the liturgy are rehearsed in cathedrals; or that wherein the actors commonly deliver themselves on the theatre at the opera, when they are to express some action or passion, to relate some event, or reveal some design.

RECKONING, or *a ship's* RECKONING. See NAVIGATION.

RECLINATION of a plane, in dialling, the number of degrees which a dial-plane leans backwards from an exactly upright or vertical plane, that is, from the zenith. See DIALLING.

RECLUSE, among the Papists, a person shut up in a small cell of an hermitage, or monastery, and cut off, not only from all conversation with the world, but even with the house. This is a kind of voluntary imprisonment, from a motive either of devotion or penance.

RECOLLECTION, a mode of thinking, by which ideas sought after by the mind, are found, and brought again to view.

RECONNOITRE, in war, to view and examine the state and situation of things.

RECORD, an authentic testimony in writing, contained in rolls of parchment, and preserved in a court of record.

RECORDER, a person whom the mayor and other magistrates of a city or corporation associate to them, for their better direction in matters of justice, and proceedings in law; on which account this person is generally a counsellor, or other person well skilled in the law.

The recorder of London is chosen by the lord mayor and aldermen; and, as he is held to be the mouth of the city, he delivers the judgment of the courts therein, and records and certifies the city-customs.

RECOURSE ON BILLS, in Scots law. See LAW, Tit. xxi. 12.

RECREMENT, in chemistry, some superfluous matter separated from some other that is useful: in which sense it is the same with scoriæ, fæces, and excrements. See CHEMISTRY.

RECRIMINATION, in law, an accusation brought by the accused against the accuser upon the same fact.

RECRUITS, in military affairs, new-raised soldiers, designed to supply the place of those who have lost their lives in the service, or are disabled by age or wounds.

RECTANGLE, in geometry, the same with a right-angled parallelogram. See GEOMETRY.

RECTIFICATION, in chemistry, is nothing but the repetition of a distillation or sublimation several times, in order to render the substance purer, finer, and freer from aqueous or earthy parts.

RECTIFIER, in navigation, an instrument consisting of two parts, which are two circles either laid one upon or let into, the other, and so fastened together in their centres, that they represent two compasses, one fixed, the other moveable; each of them divided into the thirty-two points of the compass, and three hundred and sixty degrees, and numbered both ways, from the north and the south, ending at the east and west, in ninety degrees.

The fixed compass represents the horizon, in which the

the north and all the other points of the compaſs are fixed and immoveable.

The moveable compaſs repreſents the mariners compaſs, in which the north and all other points are liable to variation.

In the centre of the moveable compaſs is faſtened a ſilk thread, long enough to reach the outſide of the fixed compaſs. But, if the inſtrument be made of wood, there is an index inſtead of the thread.

Its uſe is to find the variation of the compaſs, to rectiſy the courſe at ſea; having the amplitude or azimuth given.

RECTIFIER, in the diſtillery, the perſon whoſe employment it is to take the coarſe malt-ſpirit of the malt-ſtiller, and rediſtil it to a finer and better liquor.

RECTILINEAR, in geometry, right-lined: thus figures whoſe perimeter conſiſts of right lines, are ſaid to be rectilinear.

RECTITUDE, in philoſophy, refers either to the act of judging or of willing: and therefore whatever comes under the denomination of rectitude is either what is true, or what is good; theſe being the only objects about which the mind exerciſes its two faculties of judging and willing.

Moral rectitude, or uprightneſs, is the chuſing and purſuing thoſe things which the mind, upon due inquiry and attention, clearly perceives to be good; and avoiding thoſe that are evil.

RECTOR, a term applied to ſeveral perſons whoſe offices are very different: as, 1. The rector of a pariſh is a clergyman that has the charge and cure of a pariſh, and poſſeſſes all the tythes, &c. 2. The ſame name is alſo given to the chief elective officer in ſeveral foreign univerſities, particularly in that of Paris. 3. Rector is alſo uſed in ſeveral convents for the ſuperior officer who governs the houſe: and the Jeſuits give this name to the ſuperiors of ſuch of their houſes as are either ſeminaries or colleges.

RECTORY, a pariſh-church, parſonage, or ſpiritual living, with all its rights, tythes, and glebes.

RECTUM, in anatomy, the third and laſt of the large inteſtines or guts. See ANATOMY, p. 261.

RECTUS, in anatomy, a name common to ſeveral pair of muſcles, ſo called on account of the ſtraightneſs of their fibres. See ANATOMY, Part II.

RECURRENTS, in anatomy, a name given to ſeveral large branches of nerves ſent out by the par vagum from the upper part of the thorax to the larynx.

RECURVIROSTRA, in ornithology, a genus belonging to the order of grallæ. The beak is ſubulated, bent back, ſharp and flexible at the point; the feet are webbed, and furniſhed with three toes. There is but one ſpecies, *viz.* the avocetta, a native of the ſouthern parts of Europe. It migrates into Italy, but ſeldom to the north.

RECUSANTS, ſuch perſons as acknowledge the pope to be the ſupreme head of the church, and refuſe to acknowledge the king's ſupremacy; who are hence called popiſh recuſants. Theſe are in England charged with double taxes, not merely as Romaniſts but as recuſants.

RED, one of the ſimple or primary colours of natural bodies, or rather of the rays of light. See OPTICS.

RED, in dying, is one of the five ſimple or mother colours. Some reckon ſix kinds or caſts of red, *viz.* ſcarlet red, crimſon red, madder red, half-grain red, lively orange red, and ſcarlet of cochineal: but they may be all reduced to the three following, according to the three principal drugs which give the colours, *viz.* the kermes, cochineal, and madder.

RED, in heraldry. See GULES.

RED RUSSIA, or LITTLE RUSSIA, a province of Poland, bounded by the province of Poleſia, on the north; by Volhinia and Podolia on the eaſt; by the Carpathian mountains, which divide it from Tranſilvania and Hungary, on the ſouth; and by the province of Little Poland, on the weſt; being two hundred miles long, and one hundred broad

RED-SEA ſeparates Aſia from Africa.

REDDLE, a ſoft, heavy, red marle, of great uſe in colouring; and being waſhed and freed from its ſand, is often ſold by our druggiſts under the name of bole-armenic.

REDEMPTION, in law, a faculty or right of re-entering upon lands, &c. that have been ſold and aſſigned, upon reimburſing the purchaſe-money with legal coaſts.

REDENS, in fortification, a kind of work indented in form of the teeth of a ſaw, with ſaliant and re-entering angles, to the end that one part may flank or defend another. It is called ſaw-work and indented-work.

REDINTEGRATION, in the civil law, the act of reſtoring a perſon to the enjoyment of a thing whereof he had been illegally diſpoſſeſſed.

REDOUBT, in fortification, a ſmall ſquare fort, without any defence but in front, uſed in trenches, lines of circumvallation contravallation, and approach; as alſo for the lodgings of corps de gard, and to defend paſſages.

REDRESSING, the rectifying or ſetting any thing ſtraight again.

In a moral ſenſe, to redreſs grievances is to reform and remove them.

To redreſs a ſtag, among hunters, is to put him off his changes.

REDRUTH, a market-town of Cornwall, ſituated fifty miles ſouth-weſt of Launceſton.

REDUBBORS, thoſe who buy ſtolen cloaths, &c. and, to the end they may not be known, convert them into ſome other form, or change the colour, &c.

REDUCTION, in the ſchools, a manner of bringing a term or propoſition, which was before oppoſite to ſome other, to be equivalent to it.

REDUCTION, in arithmetick. See ARITHMETICK, p. 380.

REDUCTION, in ſurgery, denotes an operation whereby a diſlocated, luxated, or fractured bone is reſtored to its former ſtate or place.

REDUCTION, in Scots law. See LAW, Tit. xxx. 3.

REDUNDANCY, a fault in diſcourſe, conſiſting in the uſe of a ſuperfluity of words. Words perfectly ſynonymous are redundant, and ought to be retrenched.

REED, in botany. See ARUNDO.

REEF, a term in navigation. When there is a great gale of wind, they commonly roll up part of the ſail below, that by this means it may become the narrower, and not draw ſo much wind; which contracting or taking up the ſail, they call a reef, or reefing the ſail: ſo alſo when a top-maſt is ſprung, as they call it, that is, when it is cracked, or almoſt broken in the cap, they cut off the lower piece that was near broken off, and ſetting the other

part,

part, now much ſhorter, in the ſtep again, they call it a reefed top-maſt.

REEL, in the manufactories, a machine ſerving for the office of reeling. There are various kinds of reels, ſome very ſimple, others very complex.

REELING, in the manufactories, the winding of thread, ſilk, cotton, or the like, into a ſkain, or upon a bottom, to prevent its entangling. It is alſo uſed for the charging or diſcharging of bobbins or quills, to uſe them in the manufacture of different ſtuffs, as thread, ſilk, cotton, *&c.* Reeling is performed different ways, and on different engines

REEVING, in the ſea language, the putting a rope through a block: hence to pull a rope out of a block, is called unreeving

RE-EXCHANGE, in commerce, a ſecond payment of the price of exchange, or rather the price of a new exchange due upon a bill of exchange that comes to be proteſted and to be refunded the bearer by the drawer or indorſer.

REFECTION, among eccleſiaſtics, a ſpare meal or repaſt, juſt ſufficing for the ſupport of life: hence the hall in convents, and other communities, where the monks, nuns, *&c* take their refections or meals in common, is called the refectory.

REFERENCE, in writing, *&c.* a mark relative to another ſimilar one in the margin, or at the bottom of the page, where ſomething omitted in the text is added, and which is to be inſerted either in reading or copying.

REFINING, in general, is the art of purifying a thing; including not only the aſſaying or refining of metals, but likewiſe the clarification of liquors.

Refining *of gold.* See Chemistry, p. 129.

Refining *of ſilver.* See Chemistry, p. 130.

REFLECTION, the return or regreſſive motion of a moving body, occaſioned by ſome obſtacle which hindered it from purſuing its former direction.

Reflection *of the rays of light.* See Optics.

Reflection is alſo uſed, figuratively, for an operation of the mind; whereby it turns its view backwards as it were upon itſelf, and makes itſelf and its own operation the object of its diſquiſition; and by contemplating the manner, order, and laws which it obſerves in perceiving ideas, comparing them together, reaſoning, *&c.* it frames new ideas of the relations diſcovered therein. See Logic, and Metaphysics.

REFLUX *of the ſea*, the ebbing of the water, or its returning from the ſhore. See Astronomy, p. 473.

REFORMATION, the act of reforming or correcting an error or abuſe in religion, diſcipline, or the like.

The Reformation, ſo called by way of eminence, is the ſeparation of the Proteſtants from the church of Rome, in the beginning and towards the middle of the ſixteenth century.

REFRACTION, in general, is the deviation of a moving body from its direct courſe, occaſioned by the different denſity of the medium it moves in; or, it is a change of direction, occaſioned by a body's falling obliquely out of one medium into another of a different denſity. See Optics.

REFRANGIBILITY *of light*, the diſpoſition of rays to be refracted. See Optics

REFRIGERATIVE, in medicine, a remedy which refreſhes the inward parts, by cooling them, as clyſters, ptiſans, *&c.*

REFRIGERATORY, in chemiſtry, a veſſel filled with cold water, through which the worm paſſes in diſtillations; the uſe of which is, to condenſe the vapours as they paſs through the worm.

REFUGE, a ſanctuary or aſylum.

REFUGEES, French Proteſtants; who, by the revocation of the edict of Nantz, have been conſtrained to fly from perſecution, and take refuge in foreign countries.

REGAL or Royal, ſomething belonging to a king.

REGALE, a magnificent entertainment or treat given to ambaſſadors, and other perſons of diſtinction, to entertain or do them honour.

It is uſual, in Italy, at the arrival of a traveller of eminence, to ſend him a regale, that is, a preſent of ſweetmeats, fruit, *&c.* by way of refreſhment.

Regale, in the French juriſprudence, is a royal prerogative, which conſiſts in enjoying the revenues of biſhoprics during the vacancy of their ſees, of preſenting to benefices, and of obliging the new biſhop to take an oath of fidelity, and to regiſter it in the chamber of accounts. The enjoyment of the fruits of the ſee is called the temporal regale; and that of preſenting to the ſee, the ſpiritual regale.

REGALIA, in law, the rights and prerogatives of a king; which, according to civilians, are ſix: *viz.* 1 The power of judicature: 2. The power of life and death: 3. The power of peace and war: 4. A right to ſuch goods as have no owner, as waifs, eſtrays, *&c.* 5. Aſſeſſments: and, 6. The coinage of money.

Regalia is alſo uſed for the apparatus of a coronation, as the crown, the ſceptre with the croſs, that with the dove, St. Edward's ſtaff, the globe, and the orb with the croſs, four ſeveral ſwords, *&c.*

Regalia, in Scots law. See Law, Tit. xiii. 3.

Lord of Regality, in Scots law. See Law, Tit. iv. 4.

REGARDANT, in heraldry, ſignifies looking behind; and is uſed for a lion, or other beaſt, with his face turned towards his tail.

REGARDER, an ancient officer of the king's foreſt, ſworn to make the regard of the foreſt every year; that is, to take a view of its limits, to inquire into all offences and defaults committed by the foreſters within the foreſt, and to obſerve whether all the other officers executed their reſpective duties.

REGEL, or Rigel, a fixed ſtar of the firſt magnitude, in Orion's left foot.

REGENERATION, in theology, the act of being born again by a ſpiritual birth, or the change of heart and life experienced by a perſon who forſakes a courſe of vice, and ſincerely embraces a life of virtue and piety.

REGENT, one who governs a kingdom during the minority or abſence of the king.

In France, the queen mother has the regency of the kingdom during the minority of the king, under the title of queen-regent.

Regent alſo ſignifies a profeſſor of arts and ſciences in a college, who has a ſet of pupils under his care; but here regent is generally reſtrained to the lower claſſes, as regent of rhetoric, regent of logic, *&c.* thoſe of philoſophy are rather called profeſſors.

REGICIDE, KING-KILLER, a word chiefly ufed with us in fpeaking of the perfons concerned in the trial, condemnation, and execution of king Charles I.

REGIFUGE, a feaft celebrated in ancient Rome on the fixth of the kalends of March, in memory of the expulfion of their ancient kings, and particularly of Tarquin's flying out of Rome on that day.

REGIMEN, the regulation of diet, and, in a more general fenfe, of all the non-naturals, with a view to preferve or reftore health. See MEDICINE.

REGIMEN, in grammar, that part of fyntax, or conftruction, which regulates the dependency of words, and the alterations which one occafions in another. See GRAMMAR.

REGIMENT, in war, is a body of men, either horfe or foot, commanded by a colonel.

Each regiment of foot is divided into companies; but the number of companies is not always alike; though our regiments generally confift of thirteen companies, one of which is always grenadiers.

Regiments of horfe moft commonly confift of fix troops, but fome have nine.

Regiments of dragoons, in time of war, are generally compofed of eight troops; and in time of peace, of fix.

REGION, in geography, a large extent of land, inhabited by many people of the fame nation, and inclofed within certain limits or bounds.

REGISTER, a public book in which is entered and recorded memoirs, acts, and minutes, to be had recourfe to occafionally, for knowing and proving matters of fact.

REGISTER SHIPS, in commerce, are veffels which obtain a permiffion either from the king of Spain, or the council of the Indies, to traffic in the ports of the Spanifh Weft-Indies; which are thus called, from their being regiftered before they fet fail from Cadiz, for Buenos Ayres.

REGISTERS, in chemiftry, are holes, or chinks with ftopples, contrived in the fides of furnaces, to regulate the fire; that is, to make the heat more intenfe, or remifs, by opening them to let in the air, or keeping them clofe to exclude it

REGISTRY, the office, books, and rolls, in which the proceedings in chancery, or any fpiritual court, are regiftered.

REGRATOR, or REGRATER, in law, formerly fignified one who bought wholefale, or by the great, and fold again by retail: but the term is now ufed for one who buys any wares or victuals, and fells them again in the fame market, or fair, or within fifteen miles round it. See FORESTALLING.

REGULAR, denotes any thing that is agreeable to the rules of art: thus, we fay a regular building, verb, *&c.*

A regular figure, in geometry, is one whofe fides, and confequently angles, are equal; and a regular figure with three or four fides, is commonly termed an equilateral triangle, or fquare; as all others with more fides are called regular polygons.

REGULAR, in a monaftery, a perfon who has taken the vows; becaufe he is bound to obferve the rules of the order he has embraced.

REGULATION, a rule or order prefcribed by a fuperior, for the proper management of fome affair.

REGULATOR *of a watch*, the fmall fpring belonging to the balance; ferving to adjuft its motions, and make it go fafter or flower. See WATCH.

REGULUS, in ornithology. See MOTACILLA.

REGULUS, in chemiftry, an imperfect metallic fubftance, that falls to the bottom of the crucible, in the melting of ores or impure metallic fubftances. See CHEMISTRY, *paffim.*

REHABILITATION, in the civil and the canon law, the reftoring a delinquent to his former condition.

REHEARSAL, in mufick and the drama, an effay or experiment of fome compofition, generally made in private, previous to its reprefentation or performance in public, in order to render the actors and performers more perfect in their parts.

REIN-DEER, in zoology. See CERVUS.

REINS, in anatomy. See ANATOMY, p. 268.

REJOINDER, in law, is the defendant's anfwer to the plaintiff's replication or reply. Thus, in the court of chancery, the defendant puts in an anfwer to the plaintiff's bill, which is fometimes alfo called an exception; the plaintiff's anfwer to this is called a replication; and the defendant's anfwer to that a rejoinder.

REITERATION, the act of repeating a thing, or doing it a fecond time.

RELAPSE, a falling again into a danger, evil, or difeafe, from which a perfon has efcaped.

RELATION, the mutual refpect of two things, or what each is with regard to the other. See METAPHYSICS.

RELATION, in geometry. See RATIO.

RELATION is alfo ufed for analogy. See ANALOGY.

RELATIVE, fomething relating to, or refpecting, another.

RELATIVE TERMS, in logic, are words which imply a relation: fuch are mafter and fervant, hufband and wife, *&c.*

RELAXATION, in medicine, *&c.* the act of loofening or flackening, or the loofenefs and flacknefs of the fibres, nerves, mufcles, *&c.*

RELAY, a fupply of horfes placed on the road, and appointed to be ready for a traveller to change, in order to make the greater expedition.

RELEVANCY, in Scots law. See LAW, Tit. xxxiii. 48.

RELICS, in the Romifh church, the remains of the bodies of faints or martyrs, and the inftruments by which they were put to death, devoutly preferved, in honour to their memory; kiffed, revered, and carried in proceffion.

RELICT, in law, the fame with widow.

RELIEVO, or RELIEF, in fculpture, *&c.* is the projecture or ftanding out of a figure; which arifes prominent from the ground or plan on which it is formed; whether that figure be cut with the chiffel, moulded, or caft.

There are three kinds or degrees of relievo, *viz.* alto, baffo, and demi relievo. The alto-relievo, called alfo haut-relief, or high relievo, is when the figure is formed after nature, and projects as much as the life. Baffo-relievo, bafs-relief, or low relievo, is when the work is raifed but a little from the ground, as in medals, and the frontifpieces of buildings; and particularly in the hiftories, feftoons, foliages, and other ornaments of friezes. Demi-relievo is when one half of the figure rifes from the plan.

When, in a basso-relievo, there are parts that stand clear out, detached from the rest, the work is called a demi-basso.

Relievo, or Relief, in painting, is the degree of boldness with which the figures seem, at a due distance, to stand out from the ground of the painting.

RELIGION, or THEOLOGY.

I. To know God, and to render him a reasonable service, are the two principal objects of religion. We know but little of the nature of bodies; we discover some of their properties, as motion, figure, colours, *&c.* but of their essence we are ignorant: we know still much less of the soul; but of the essence or nature of God, we know nothing: it is the prerogative of the Supreme Being alone to comprehend his own essence: all the efforts that we can make to attain that knowledge, are arrogant and ineffectual; it is foreign to the nature of a limited spirit: but our destiny is that of a man, and our desires are those of a God. In a word, man appears to be formed to adore, but not to comprehend, the Supreme Being.

II. We may say, however, with Virgil, *Jovis omnia plena*; God manifests his existence, not only to the internal sensations of our minds, but in every object that surrounds us in the whole frame of nature; and if we cannot comprehend the Supreme Being by our senses, we may discover his attributes by our reason, almost as clearly as we distinguish the properties of matter, and many other objects: and this knowledge is sufficient for us. The end of every other science is some temporal happiness; theology alone proposes an eternal felicity; its object therefore differs from all other sciences, as the age of threescore and ten differs from eternity. We cannot wonder therefore, that all the inhabitants of the earth, from the time of the creation, have made it their principal study, and have exerted all their abilities in the cultivation of it: we ought much rather to be astonished that it does not yet more strongly engage the attention of mankind; and that while they labour so assiduously to acquire those sciences, whose utility extends to so short a space of time, they should so frequently neglect that object which can secure their felicity in a future, certain, and eternal existence.

III. From the first knowledge that we have of the world, that is to say, for about five thousand years past, men have blindly searched after the idea of the true God; and by the weakness of their discernment, they have fallen into a thousand errors. Paganism at first covered the whole earth, except that family alone which became the stock of the Jewish people: this paganism among different nations had different mixtures of idolatry. Moses first made known to the Hebrews the true God, and prescribed them his worship: his religion, however, was not adopted by any other people, not even by their neighbours. Jesus Christ appeared upon the earth, abolished a part of the Judaic law, reformed the religion of Moses, taught his divine doctrines, and offered himself as a sacrifice for the salvation of mankind. His gospel made a happy progress over all Europe, that is, over the then known part of the earth. Some time after, Mahomet arose in the east, and preached a religion that he had compounded of the Jewish and Christian, and of his own ideas. Lastly, came Luther and Calvin, who reformed the errors which, according to them, had been introduced into Christianity under the reigns of the popes; and gave the idea of what is called the Protestant Religion. Confucius had taught the Chinese, and Zoroaster the Indians, religions drawn partly from philosophy, and partly from paganism; but the extent of these was very confined. All these religions, and their different sects, have had their theology, their priests, their ceremonies, their triumphs, and even their martyrs.

IV. We shall not speak here of religions that are extinct, or that yet exist, but at a distance far from us: we shall treat only of the Christian theology, which teaches us to know God, by revelation and by the light of reason, so far as it is possible for the weakness of the human mind to comprehend that inscrutable Being. The knowledge of the true God is indeed of little utility to man, unless he can suppose that there is some connection or relation between that Supreme Being and himself. Now it is from these connections or relations that are derived the necessity of the knowledge of the true God, and of the true manner in which he is to be worshipped: and this it is that forms the Christian theology; of which we shall now give the analysis.

V. To ascend by a chain of reasoning from things visible to things invisible, from palpable to impalpable, from terrestrial to celestial, from the creature even up to the Creator, is the business of theology: it is not surprising, therefore, that the union of many doctrines is necessary completely to form such a science. To understand, and properly to interpret the scriptures or revelation, demands not less sagacity than assiduity. The gift of persuasion is also essential to the ministers of the gospel. And lastly, the civil givernment has committed to their care certain functions of society, which relate, or seem to relate, either to the doctrines or morality of the gospel. They assemble, for example, in bodies to form consistories; they judge in matrimonial cases; they carry consolation and hope to the souls of the sick; they prepare for death those criminals which justice sacrifices to public safety; they take upon themselves the charge of *Ephori*, with the inspection of some pious foundations; they distribute alms; they administer the sacraments, *&c.*

VI. To discharge fully so many duties, the theologian has need, 1. Of several preparatory studies; 2. Of some theoretic sciences; and, 3. Of many doctrines which have for their object his ministerial office. The first are,

1. The languages; and among these,
   - (*a*) His native language, in which he is to preach and exercise his ministry, and with which he ought to be perfectly acquainted.
   - (*b*) The Latin language, which is the language of the learned world in general.
   - (*c*) The Greek language, in order to understand the New Testament.
   - (*d*) The Hebrew language, of which the Talmudian and Rabbinical idioms are a part.
   - (*e*) The Arabic language.
   - (*f*) The Syriac language.

(*g*) The

(*g*) The French language. And
(*h*) The Engliſh language. The two latter of which now appear neceſſary to every man of letters, and particularly to a theologian, on account of the excellent works which are wrote in thoſe languages.

2. The principal parts of Philoſophy; as,
   (*a*) Logic.
   (*b*) Metaphyſics.
   (*c*) Moral philoſophy.
3. Rhetoric and eloquence, or the art of ſpeaking correctly, of writing with elegance, and of perſuaſion.

To which may be added,

4. The elements of Chronology, and Univerſal Hiſtory.
5. The ſtudy of the Jewiſh antiquities.

He who would devote himſelf to the important employment of a theologian, and has the noble ambition to excel in it, ſhould early impreſs on his mind theſe truths: that the years which are paſſed at an univerſity are few; that they run rapidly away; that they are entirely engroſſed by the theoretic ſciences; and that he who does not carry with him to the univerſity a fund of knowledge in the preparatory parts of learning, commonly brings very little away, when his age or his parents oblige him to quit it.

VII. The theoretic ſciences of a theologian are,

1. The Dogmatic, or the theory of theology; which ſome Latin authors name alſo *thetica*, or *ſyſtematica*.
2. The Exegeſis, or the ſcience of attaining the true ſenſe of the holy ſcriptures.
3. The Hermeneutic, or the art of interpreting and explaining the ſcriptures to others. This differs in general but little from the exegeſis, and in ſome reſpects is quite the ſame.
4. Polemic theology, or controverſy.
5. Natural theology.
6. Moral theology.
7. Sacred criticiſm.
8. The hiſtory of the Church, under the Old and New Teſtaments.

VIII. The practical ſciences of a theologian are,

1. Paſtoral theology, which is divided into,
   (*a*) Homiletic.
   (*b*) Cathechetic.
   (*c*) Caſuiſtic.
2. Conſiſtorial theology, which comprehends
   (*d*) The Canon law.
3. The prudential exerciſe of the different functions of the miniſtry.

We do not here particularly name the *patriſtic theology*, (theologia patrum ſeu patriſtica,) becauſe all Chriſtian communions are not agreed in their opinions concerning the degree of authenticity and infallibility that is to be attributed to theſe ancients fathers of the church. The Proteſtants believe, that theſe primitive theologians were liable to error in their ſentiments as well as thoſe of our days: and, in all probability, that they were leſs ſkilful, leſs learned, leſs clear, and leſs accuſtomed to cloſe reaſoning, than the latter, as philoſophy was then more imperfect. But as we find in the writings of theſe fathers, many elucidations of the doctrine of the primitive apoſtles, and many irrefragable teſtimonies of the authenticity of divers remarkable events, which ſerve to eſtabliſh the truth of Chriſtianity; and as we there ſee, moreover, the origin of errors, of arbitrary ceremonies, and of many doctrines that have been introduced into the Chriſtian church; the reading and the ſtudy of theſe fathers cannot but be of great utility to the theologian. To a virtuous citizen, who unites ſuch various ſciences, and employs them in pointing out to his fellow-citizens the path that leads to temporal and eternal felicity: in a word, to a wiſe theologian, what veneration is not due?

Of the Dogmatic.

I. Under the general term of dogmatic, we comprehend that part which the different writers on theology have called ſometimes theoretic, ſometimes ſyſtematic, and ſometimes thetic theology, *&c.* The term dogmatic appears to us the moſt general, and the moſt juſt, to expreſs the ſubject that we intend, as it comprehends *an entire ſyſtem of all the dogmas or tenets that each religion profeſſes;* whether it teach theſe dogmas by the way of theſis, as articles of faith; by public lecture; by catechiſing; or any other manner whatever.

II. Every poſitive religion muſt, naturally, have a ſyſtem of certain points of doctrine to propoſe to its followers; otherwiſe, each one would form a particular ſyſtem according to his own fancy, there would be as many different religions as there are individuals on the earth, and each ſociety would conſiſt of a confuſed maſs of fantaſtic opinions; as the different modes of thinking, and the different degrees of diſcernment, are varied and compounded by mankind to infinity; but truth, on the contrary, is uniform and invariable.

III. The Chriſtian religion is as compound in its dogmas, as it is ſimple in its moral principle. It includes, 1. The dogmas founded on the lights of reaſon: 2. Thoſe drawn from the Old Teſtament, and the law of Moſes: 3. Thoſe taken from the New Teſtament, and the doctrine of Jeſus Chriſt: 4. Thoſe that the fathers of the church have drawn from the Holy Scriptures: 5. Thoſe that the church, under the New Teſtament, has preſcribed to Chriſtians, by œcumenical and other councils aſſembled in different ages: 6. The dogmas that the popes, in quality of heads of the church, have eſtabliſhed by their bulls: and to theſe muſt be added, on the part of the proteſtants, 7. The dogmas that the reformers, eſpecially Luther and Calvin, have taught: 8. The deciſions of ſynods; and laſtly, the tenets that are maintained by the different ſects, as Socinians, Anabaptiſts, Quakers, *&c.* Each of theſe particular religions or ſects pretend to ſupport their dogmas both by reaſon and revelation: we do not here offer a work of controverſy, and are very far from attempting to determine on which ſide truth and reaſon are to be found.

IV Our zeal, however, for the Chriſtian religion in general, which we regard as perfectly divine, and as the only religion adapted to promote the happineſs of mankind in this world, and to ſecure it in the next, and the deſire we have that it may endure to the end of time, compels us to make in this place one important reflection; which is, That ſimplicity is ever an eſſential attribute of perfection, as complexity is of imperfection. Now, it cannot be denied, without doing violence to truth, that among the different dogmas of which we have been ſpeaking there are ſeveral that ſeem to be founded on ſpeculations very abſtruſe, on ſubtilties very intricate, and on interpretations very ambiguous. God certainly never intended that all mankind ſhould be theologians; he has not given them his divine word to be the cauſe of diſcord among men, nor that they ſhould paſs their whole lives

lives in a painful search after *objects of belief*, and *articles of faith*; and that they should forego, in that pursuit, the necessary offices of life, and their duties as citizens. The dogmas, then, essentially necessary to the welfare of mankind, ought to consist of a small number, and to bear the marks of simplicity and perspicuity; without which they must be imperfect, and consequently the work of man. Our intention, in making this remark, is, to extend our voice, if it be possible, even to posterity, whom we would conjure not to injure our religion, so holy and so admirable, by a multiplicity of dogmas. It is necessary, however, that the divine, who makes it his study and his profession, should be thoroughly acquainted with the theory of this science, in order that he may be able to instruct the sincere Christian, and to explain the nature of each particular dogma, as well as the solidity of its proofs; and to this it is that the study of the dogmatic leads; of which we shall now continue the analysis.

V. The dogmatic is then nothing but *a succinct exposition of all the dogmas of the Christian religion, in a natural and philosophical order*. By the word philosophic, we do not here precisely mean the method of mathematicians, in the manner the late M. Wolff has applied it to philosophy; every subject is not capable of a demonstration so exact and rigid; but a regular order is required in the arrangement of the general system, and a connection is to be preserved in the several matters that form it: the definitions should be just; the divisions exact; the arguments solid; the proofs clear; the citations conclusive; the examples striking; and, in a word, every thing should be adduced that appertains to so important a discipline.

It is very essential, moreover, in the dogmatic, at the beginning of each thesis, to explain the several terms that are peculiar to it, and that use has established in treating of theology; to draw from each definition certain axioms, and from thence to form propositions, and to illustrate them by solid reasoning. Lastly, we should not neglect, in such a system, to make use of the expressions used in the symbolic books that have been received by the whole Christian church, and which cannot be rejected or altered, without causing a confusion in our ideas, and in the general system of the Christian religion. But before we make the least advance in the study of Christian theology, it is indispensably necessary to examine the proofs by which the truth, the authenticity, and the divinity of the sacred and canonical books are established; for this is the foundation of all the dogmas and the axis on which its whole doctrine turns.

VI. The systematic part of the Christian religion, among the great number of its dogmas or theses, has *three principal*, from which all the rest are derived, and which form the basis of its whole doctrine:

1. The existence of one God in three persons.
2. The necessity of a Mediator or Redeemer.
3. The real appearance of the Mediator or Messiah on the earth.

Whoever writes, professes, or teaches the dogmatic, should be, above all things, careful well to establish these important truths; to evince them by the strongest and most evident proofs, drawn partly from the lights of reason, and partly from revelation: and he will then see, with what facility all other theses flow from, and how easy it will be to prove them by, these.

VII. The infinite variety that is found among mankind in their manner of thinking, and in their method of treating subjects; the frequent changes that have happened in the exterior form of philosophy, and in the method of treating it; the oppositions that have been raised at all times against divers doctrines of the Christian religion; all these have produced, among theologians, different systems of the dogmatic. Sometimes they have combined positive theology with morality, and have formed a system that they call *theologia theoretico-practica*, or *theologia thetico-moralis*, &c.: sometimes they have refuted the arguments that others oppose to certain theses; and from thence has arose a system that they call *theologia thetico*, or *dogmatico*, or *positivo-polemica*: sometimes they have joined to natural theology that of revelation; and have formed a dogmatic, called *philosophico-theologica*: and so of the rest. But, besides that these distinctions and denominations are in themselves pedantic, it is at all times more eligible, in every science, to avoid confounding with each other the several branches of which it consists. The different dogmas, morality, philosophy, and controversy, are separate articles; and when each of these parts of theology are separately treated, they are disposed with more order in the mind, and a greater light is diffused over their several subjects.

VIII. It appears, moreover, from the simple enumeration that we have made, in the third section, of the different principles on which the dogmas of the Christian religion are founded, that, to be thoroughly acquainted with its whole theory, the theologian should also apply himself to the study of the symbolic books of its communion, and especially should be well versed in the *Creed of the Apostles*; that of *Nice* and *St Athanasius*; the book called *Formula concordiæ*; the *Theses of the council of Trent*; the *Catechisms of Luther*; the *Confession of Augsbourg*; the *Articles of Smalcalden*; the *Catechism of Heidelberg*, &c. That he should be well acquainted with that part of Theology that is called *patristica*: that is to say, that he should be well read in the fathers of the church; that he should not be ignorant even of *scholastic theology*; that he should at least know the frivolous subtilities and the complicated method of the ancient scholastic divines, which was derived from the philosophy of Aristotle and the schools; that he should make a serious study of the *sacred* history of all ages, the *councils and synods*; that he should, above all, never lose sight of *natural theology*; and, lastly, that it is indispensably necessary that he should procure a good bibliotheque or treatise of ecclesiastical writers *, which he may consult occasionally, and learn from thence to know the best guides. The more a theologian applies himself to all these subjects, the more ability he will acquire in this science, and the more perfect he will be in the theory of that religion which it is his duty to teach to others.

IX. Revealed religion being founded (at least in great part) on natural religion, and philosophy being the source from whence the principles and the knowledge of the latter are derived, it is evident that philosophy is intimately connected with theology: nevertheless, the aid of the former is to be employed with precaution, and is not to be regarded as the foundation of the theological dogmas, but only as a mean by which they may be explained and enforced. The Holy Scriptures constitute, perpetually, the true basis of revealed theology: philosophy effectually concurs, however, to

* Those of Du Pin and William Cave are most celebrated.

to prove the existence and the attributes of the Supreme Being; the necessity of the creation of the universe by Almighty God, in opposition to every other possible manner of its being produced: it furnishes, moreover, plausible conjectures concerning the intention of the Almighty in creating this world; it proves the necessity of a perpetual power to preserve it; it supposes, that, as God could not produce any thing that was not perfect in its kind, he could not have created man as he now is; it vindicates the conduct of the Supreme Being, in appointing chastisements for transgressions, by shewing that moral evil was not introduced into the world by absolute necessity, but by the abuse of liberty, the most noble prerogative of the human soul; it determines the necessity of a Mediator; it furnishes arguments for the belief of the immortality of the soul, and of a future state that has a relation to the moral actions of this life; and lastly, it inspires a love of God as a Being of sovereign perfection, a gratitude towards him as our creator and preserver, and a submission to his will as our supreme ruler and director, motives of all others the most powerfully conducive to a virtuous conduct.

X. It is this use which theology makes of philosophy, that has given occasion to divide the theses of the dogmatic into pure and mixed; that is, into theses that are founded entirely upon revelation; and, such as arise from an union of reason with revelation. Of the first sort are, 1. The article of the Holy Scripture itself; which treats of its divine origin, its authority, and its efficacy. 2. The dogma of the Trinity. 3. That of the origin of evil, or of original sin. 4. The whole article of Jesus Christ. 5. The dogma of the efficacy and operations of the Holy Ghost. 6. That of the sacraments. 7. That of repentance. 8. That of the belief in Jesus Christ. 9. That of good and bad angels. 10. That of the end of the world, and the last judgement. 11. That of the church, &c. The mixed dogmas or theses are, 1. The doctrine of a Supreme Being, in general; his being, his attributes, and his works. 2. That of the creation. 3. That of providence, or the conservation of the world. 4. Of sin, as a transgression of the laws of God. 5. Of rewards and punishments after death, *&c.* He that attentively studies, thoroughly comprehends, and well digests all these theses, will have reason to rest content with his knowledge of the dogmatic.

Of the EXEGESIS *and the* HERMENEUTIC.

I. THE term *Exegesis* is derived from the Greek verb EXE'GONSTAI, which signifies to *relate* or *explain*; and that of *Hermeneutic* from ERME'NEUEIN, which means to *search into*, and, in a figurative sense, *thoroughly to examine*, and *interpret*. The learned, but especially the theologians, make use of these words, sometimes as synonyma, to express the same thing, and sometimes (as there are scarce any terms that are perfectly synonymous) to denote a small difference between two parts of learning of the same nature. By the word Exegesis they mean, *that science which teaches clearly to investigate the true sense of the original text of the holy scriptures*; and by the Hermeneutic, *the art of interpreting and explaining the holy scriptures to others* *. This distinction is so subtle, that it becomes almost frivolous. They are, in fact, the same science; the one is only an explication of the other, and for that reason we think we are authorised to treat of them together in this place.

II. In order to the true understanding of the sacred text of all the books contained in the Holy Bible, whether of the Old or New Testament, it is absolutely necessary that the theologian be thoroughly acquainted, not only with the languages in which these books were originally wrote, but likewise with the history and antiquities of those remote times in which their authors lived. With regard to researches into the history of the Jewish nation, their antiquities, their morals, and their customs, it will be found advantageous to pursue it as far as the nature of the subject will admit, without, however, engaging in critical subtleties, that lead to a labyrinth to which there is no end, and have spread more clouds over theology than even the scholastic controversies have formerly done.

III. He who would succesfully interpret any work whatever, should first consider the spirit in which it is wrote: he should attentively reflect on the general design of that work, and the particular motives that induced the author to undertake it; his genius, his passions, his taste; the time, the place, and the people for whom it was written. These considerations are, above all, necessary, when we would undertake the explication of the Holy Scriptures. Independent of those reflections which the theologian will of himself naturally make on the subject, the excellent commentaries which we have on the Bible, in which the greatest men of every age have exercised their genius, may serve him as a guide in this course. The critical histories will likewise afford great aid, and throw admirable lights on this matter. Clear ideas, an acute discernment, and a solid judgment, will complete the work.

IV. With regard to the languages necessary for understanding the sacred text, the Hebrew language hold the first place. The student should have early recourse to the *manner of accenting*, and the *Massoret* of the Jews: to these he may add, with advantage, the reading of the Jewish interpreters or *Rabbins*. There are the grammars and dictionaries, Rabbinic and Talmudic, of Buxtorff, Cellarius, and others, which greatly facilitate his study. The Talmud it is true is stuffed with a thousand fables and ridiculous stories; it contains, notwithstanding, some things useful and curious, which the learned theologian should not entirely pass over. For the well understanding of the explications and applications of the best Rabbins, he should likewise have recourse to their *Cabbala*, which they divide into *real* and *liberal*.

V. The *Massoret* is a kind of critic on the Hebrew text, that the ancient Jewish doctors invented, in order to prevent any alteration. They there count the verses, the words, and the letters of the text, and have marked all their diversities. The text of the sacred books was formerly wrote in close continuation, without any distinction of chapters, verses, or even words, after the manner of the ancients, as we still see in many manuscripts. As the sacred books have undergone an infinity of changes, which form various readings; and as the true original has been either lost or altered; the Jews have had recourse to this rule, which they have judged infallible, and which they call the Massora, to fix the reading of the Hebrew text.

VI. The ancient Rabbins, or Doctors of the Jewish law, have

* The Exegesis is a kind of rational grammar. The Hermeneutic is the art of interpreting entire passages.

have wrote many superstitious traditions, which they observe as scrupulously as the law of Moses; and have also made many commentaries on the sacred text, among which there are some that are good and useful. The language they use is different from the common Hebrew, as is also the Rabbinic character.

VII. The *Talmud* is a book in which the Jews have comprised every thing that concerns the explication of their law, and the duties that are enjoined them by scripture, by tradition, or by authority of their doctors; by their particular customs, their civil government, their doctrine, their ceremonies, their moral theology, the decisions of cases of conscience, *&c.* The Talmud is composed, in general, of two parts; which are called, the *Mischna*, and the *Gémara*. The Jews would not at first commit these things to writing; but after the destruction of Jerusalem, finding themselves dispersed in the world, they became obliged to do it. They had two celebrated schools, one at Babylon, and the other at Jerusalem; at these schools were made two different collections of traditions, each of which is called the Talmud. The commentary, called Gémara, contains the decisions of the Jewish doctors, and their explications of the text; it is filled with absurdities, reveries, and ignorance, and written in a vulgar style. On the contrary, the text, that is called Mischna, consists of solid reasoning, written in a pure style. The Rabbin Moses, son of Maïemon, has made an abridgement of it, which is of more value than even the Talmud itself.

VIII The Cabbala or Kabala (a Hebrew word, which properly signifies tradition) contains the different interpretations of the laws of God by different Rabbins; their decisions on the obligations that they impose, and the manner of performing them. There are some of them that are occult and mysterious, and consist in singular and mystic significations which are given to a word, or even to each of the letters that compose it; and from these various combinations, they draw explications of the scripture very different from that which it seems naturally to import. This *Cabbala* is divided into three kinds: the first they call *Gématria*, and consists in taking the letters for the numbers of arithmetick, and explaining each word by the arithmetick value of the numbers that compose it: the second is called *Notaricon*, and consists in taking each letter for a word, or in composing a word of the first letters of several words: the third is called *Thémura*, and consists in changing a word, and the letters of which it is composed.

IX. The *Chaldee* seems to be indispensible, after the study of the Hebrew and Rabbinic; this is properly no more than a particular dialect of the Hebrew language. The Jews give to their commentaries, and to the Chaldaic paraphrase on the Scripture, the title of *Targum*. As, during their long captivity in Babylon, they had forgot the Hebrew, and only retained the Chaldean language, it became necessary to explain the prophets in that language; and to this necessity is owing the first commencement of the Chaldean paraphrase. The Rabbins have since collected together these divers interpretations of their doctors, which form the paraphrase that is called Targum.

X. The other oriental languages, as the Arabic, the Syriac, the Samaritan, and the Coptic, are also of great use to the learned theologian

XI. All the books of the New Testament being wrote in Greek, the study of that language becomes necessary to the theologian. But it must not be imagined, that this Greek is that of Athens or Lacedemon; and that they who understand the New Testament, will fully comprehend Homer, Anacreon, or Thucidydes. It is very necessary to observe, here, that during the Babylonish captivity, the Jews, as we have just said, having forgot the Hebrew, and having adopted, in process of time, several idioms, the Greek language was at last successfully diffused over almost all the east; and, at the time of the coming of Jesus Christ upon the earth, that language was in use in Palestine, not only among men of letters, but in the polite world: every thing was wrote, every thing was treated of, in Greek. The Jews no longer understoood the Holy Scriptures in the Hebrew language, but made use of the version that the Septuagint had made of the Old Testament in the Greek language. The evangelists and the apostles, therefore, wrote their historic relations, as well as their epistles or letters in the same language: but their style is not pure, being strewed with hebraisms and barbarisms, and with theological terms and phrases. The four evangelists differ, moreover, among themselves, with regard to their style; and so do the apostles: St Matthew is not so elegant as St John; nor St Jude so elegant as St Paul, who was a man of letters, and an able writer. The diction of St Luke is the most elegant, and most correct, especially in his book of the acts of the apostles.

XII. The translations that have been made of the sacred books in the west, will also very frequently assist in clearing up many passages.

XIII. The Jewish antiquities are naturally connected with the study of the sacred history of the Old Testament. *Josephus* is the best author who has wrote on this subject. *John Marsham*, *Vossius*, *Lelius*, *Gyraldus*, &c. are the moderns to whom we are indebted for learned researches in these maters. *Hermannus Wilsius*, in his treatise *de Ægyptiacis*, has thrown admirable lights on the Egyptian antiquities. The antiquities of the Chaldeans, Babylonians, Persians and Medes, has been excellently well explained by *Barnabas Brisson*, in his book *de regno & rege Persarum*; and by *Thomas Hyde*, in his treatise *de religione et sacris Persarum*. The writings of *Meursius*, and the *Compendium Antiquitatum Græcarum* of *John Potter*, are very useful to give theologians an idea of what they will find necessary to know of the Grecian antiquities; and lastly, the abridgement of *Cantel* will make them sufficiently acquainted with the Latin antiquities.

XIV. *Spencer* has given an excellent work on the ceremonies of the Jewish religion, *de Legibus Hebræorum ritualibus*, &c. We have likewise works that fully treat of their temples, their sacrifices, their priests and Levites, their passover and purim, of their tithes, their vestments and sacred habits, and of their manners and customs; but it would be too prolix to mention all these in this place.

XV. The modern commentaries on the Holy Scriptures may also serve to instruct the young theologian; but he should use them with caution and moderation. All that glitters is not gold, as well in this instance as in others; and a man of learning should not often make use of other peoples eyes.

XVI. The Bibles called *Polyglots* are also of great assistance in interpreting the sacred text. They are printed in several languages The first is that of cardinal *Ximenes*, printed in the year 1515, and called the *Bible of Complute*; it contains the Hebrew text, the Chaldean paraphrase,

phrase, the Greek version of the Septuagint, and the ancient Latin edition. The second is that which is called the *Royal Bible*, printed at Antwerp in 1572. The third, that of *le Jay*, printed at Paris in 1645. The fourth is the *English polyglot*, printed at London it 1657, of which Walton is the editor. There are still several more that have been printed since, but they are neither so complete nor so celebrated as the former.

XVII. The Bibles that are called *Biblia Glossata*, are also here of very great use. The sacred text is there every where accompanied with explanations and observations. There are of these in each of the three principal communions of the Christian Religion, and in most of the modern languages of Europe. Lastly, as the interpretation of the sacred text depends in a great measure on the lights and the proofs drawn by comparing together different passages of scripture, there are several Bibles where the editors have placed, on the side of each verse of the text, what they call the *Concordance*, that is, a citation of other parallel passages, which are found dispersed in the Old and New Testament. These Concordances are of daily and indispensable use to the divine, in composing his sermons, and in many parts of his ministry. See BIBLE.

XVIII. These parallelisms are yet different from that which theologians call the *real parallelism*; by which they mean, *the relation that the typical or parabolic sense of a passage has with what the expressions literally imply, or seem to imply; the mystic sense with the real sense; the figures and the images that the sacred authors have employed, with the things or the objects that they intended to describe.* The greatest theologians have taken infinite pains in determining these points, explaining them, and producing their proofs: in many places they have succeeded; and we cannot but admire their sagacity, their zeal, and their success: it must be acknowledged, however, that they have not yet cleared up all the obscurities; that there are many dark passages still remaining in the prophets, in the Song of Songs, in the book of Job, and above all in the Apocalypse; on which have been hitherto thrown mere glimmerings, which are very far from affording a sufficient light. The explications that have been attempted of these passages are frequently so unjust, so unnatural, and improbable, and at the same time so futile, that they rebel against common sense, and only give us occasion to deplore the imbecillity of the human understanding.

XIX. The last labour of him who would become acquainted with the Hermeneutic, is in what is called *Lectio Acroamatica*; by means of which, each book of the Holy Scripture is examined from one end to the other, with relation to geography ancient and modern, genealogy, chronology, history, and antiquities; from whence a rational system is formed, according to the rules of sound logic. This work is attended with so many difficulties and distractions, that it is almost impossible to accomplish it, without the assistance of a guide, an able professor, and a complete academical course.

XX. Furnished with these ideas, the theologian may venture to investigate the true sense of those passages of Holy Scripture that may appear to him obscure, contradictory, or difficult, and to interpret them to others: but he will be more wise, and less vain, than to attempt to impose his decisions on mankind, at all times, as authentic and infallible. The human discernment is ever confined and imperfect; and God has not granted to any man, to any theologian, or assembly of divines, an exclusive power of interpreting his divine word: he has moreover denounced his anathema against all those who shall add, or take away, a single word thereof. But to explore the true sense of any passage, and to explain it to others, cannot certainly be deemed either adding or retrenching.

Of SACRED CRITICISM.

I. As the authors and professors, who treat of the different parts of theology, make frequent mention of the sacred criticism, we must not omit to shew in what manner it is connected with the Exegesis and the Hermeneutic, and in what respect it forms a separate doctrine or science. Criticism, in general, is in fact no more than a superior part of grammar; a kind of rational grammar founded on reflection, and the rules of language; but which employs the aid of divers other sciences, as history, chronology, antiquities, *&c.* in order to search out and determine the true sense of an obscure or ambiguous passage. The sacred criticism is only distinguished by its object; it adopts the same rules, but it adds others which take their rise and principles from the peculiar language of the New Testament; and has regard to the Bible in general, an account of the nature, essence, and qualities of its divine Author. So far it has an intimate connection with the Exegesis

II. But, if we would consider it as a separate study, we may say, that it is a science which is employed in examining the exterior circumstances of the Holy Scripture. For example: in what time each book was wrote; who was its author; the precision and fidelity of the text; the distinction between the canonical books and the apocryphal; and many other matters of like nature. In order still the better to show in what manner, and with how much precaution, the sacred critism proceeds in its operations, we shall here recite some of those subjects that belong to its province.

III. It is commonly received, that it was Esdras who, after the return from the captivity of Babylon, collected and fixed the canon of the sacred books of the Old Testament. This at least is the opinion of the Jews, who all attribute to him that glorious work; and the assertion appears so much the more probable, as it was the same Esdras who reestablished their state, who brought the whole Jewish people into one body as a nation, and formed the Judaic republic, which was so intimately connected with their religion. The collecting of the canon of the books of the New Testament is attributed, with great appearance of probability, to St John; although historic and formal testimonies of it cannot be produced, unless it be what Eusebius relates of the four Evangelists. In process of time, each council has decided what books should thereafter be held by the Christian church as canonical; and we commonly find, at the end of the decrees of each council, a repertory or list of those books.

IV. The Old Testament was wrote in Hebrew, except a small number of passages where the dialect is Chaldean. The form of the letters or characters, as we now have them, are also properly Chaldean; whereas, before the Babylonish captivity, the Samaritan character was probably used. Buxtorff and Capell have had warm disputes upon the subject of the vowel-points: the former would retain these points, and the latter rejects them; each of them has had his adherents. As it is impossible to decide in this dispute but by historic proofs;

proofs; and as these are not to be had, either for one side or the other; it is best to leave the affair undecided: not totally rejecting the points, however; as they are of infinite use in the study of the Hebrew language. They who love to introduce novelties into religion, (say the partisans of Buxtorff,) would doubtless be charmed to see the points to-totally abolished, because they then could make whatever they pleased of the sacred text. The adherents of Capell maintain, on the contrary, that by the ignorance or inadvertence of copyists, these points may have been transposed formerly, or may be easily confounded and wrong placed hereafter; which may occasion the most dangerous errors; may give rise to contrary meanings, and whimsical explications of the scripture; whereas, by not admitting the points, an able theologian will preserve, at least, the liberty of explaining a passage according to analogy, and the rules of good sense.

V. The *accents* have given rise to full as many disputes. But this question is not decidable but by the same method as the preceding: for we clearly see, by all the ancient manuscripts, that even the Greeks and Romans have wrote without accents, but that both one and the other make use of vowels. In poetical works especially, it is almost impossible to omit them; and that language being now dead, without accents we can find no cadence, no measure. Father Montfaucon asserts, with great appearance of probability, that accentuation was not introduced till the seventh century

VI. The language of the New Testament is the Greek; for all that is said of the gospel of St Matthew being wrote in Hebrew, and of that of St Mark being originally composed in Latin, is but weakly supported. The style, as we have already remarked, is not pure, whatever some zealots may improperly, and without reason, assert to the contrary. The language of the New Testament abounds with hebraisms.

VII. The precision, the truth, and correction of the text, is the result of repeated and judicious comparisons of the variations; of which there are, according to Dr Mill, more than twenty thousand. These variations have proceeded, partly from the negligence of the copyists, and partly from the ignorance of the revisors and correctors of the ancient manuscripts, who have frequently added and inclosed the comments, which were wrote in the margin, with the text. The heretics of the first ages, and the impostors, have also made divers alterations in the text itself, in order to support their errors; and these alterations have slid into other copies. It is the common rule to follow the most ancient manuscripts; as it is supposed, with reason, that they are the most correct: and to these are also added the most ancient versions.

VIII. The first of these versions is that of the *Septuagint*, which has been at all times highly esteemed, as well by the Jews as the Christians. The Hebrew language being lost by the Jews during the captivity in Babylon, and the Grek dialect becoming the common language of the east, that version was made in Egypt by public anthority, and for the use of the common people. The second is that called the *Vulgate*, which was formed from the translation of St Jerome, and from another that was called *Versio antiqua*. After these two translations come the Greek versions, among which are reckoned, 1. That of *Aquila*, who has translated the original Hebrew verbatim, by putting over each word of the Hebrew text, its corresponding Greek term. 2. That of *Symmachus*, who applied himself to write the Greek with purity and elegance. 3. That of *Theodotion*, who has very closely followed the text, notwithstanding the fine language he employs. *Origen* published these versions in six languages in his edition of the Old Testament, which he calls *Hexapla*. To all these versions may be added, 4. Those of *Jericho* and *Nicopolis*, which are much celebrated. We have not now any one of these versions entire. The fragments that remain of them have been collected and published by *Drusius* and F. *Montfaucon*. Lastly, The *Syriac versions*, of which one was made on the Hebrew text, and the other on the Greek.

IX. The sacred criticism is likewise employed in acquiring a knowledge of the principal and most celebrated manuscripts, as well of the sacred text itself, as of the translations; in learning to discern the hand-writing, and the essential characteristics which distinguish the real original from the counterfeits: and lastly, it is employed in knowing the best modern editions of the Holy Bible; as for example, the Polyglots, among which those of London, of the years 1653 and 1655, are the best. The introduction by Walton, which is at the beginning of these editions, is a model and a masterpiece of sacred criticism.

Of Moral Theology.

I. If it were allowable to compare the Saviour of the world to a weak mortal, we would say, that the conduct of Jesus Christ resembled that of Socrates, who has left us no part of his doctrine in writing, but whose whole instructions (as well as the particulars of his life) have been collected, digested, and published, by his disciples. The Evangelists are the only historians of the Messiah: it is to their labours that we owe the knowledge of his actions upon earth, and his divine doctrine. The four Evangelists, and the Acts of the Apostles wrote by St. Luke, contain therefore *alone* the history of the life of Jesus Christ, and the doctrine that he taught. His apostles and disciples began by paraphrasing his doctrine, as well by their evangelic sermons, as in the epistles they addressed to the faithful of several Christian Churches: they have given explications, and have added pastoral instructions, which are in effect admirable; but which, nevertheless, form not the original text of the discourses of our Saviour. The bishops of the apostolic century, the fathers of the church in all succeeding centuries, the other bishops and ecclesiastics, the councils, the synods, the doctors of theology, the popes, the consistories, the reformers likewise, and an infinity of theologians, have drawn from the Gospel, and sometimes also from the letters of the apostles, and from other commentaries on the Gospel, various tenets; which, united, form at this day the general system of the Christian Religion. The theologians who devote themselves to the service of the altar, study this system in the dogmatic: the laity learn it by means of catechisms; and after they have made confession of their faith, solemnly adopt it, when they are received into the bosom of the church.

II. It is not the same with regard to the morality of Jesus Christ, which every one may read in the Gospel; and to know which, it is not necessary to become learned, nor to study a complicated system. If the dogmatic were not armed with a thousand arguments to establish the Divinity of Jesus Christ, yet would the morality of his Gospel sufficiently prove it; seeing that it is perfectly holy, entirely simple,

simple, strictly just, and most completely adapted to promote the felicity of the human race in this world, and in that which is to come. The Saviour of the world has not enjoined any part of mankind to engage in disputes, or abstract refinements: the sole command that he has given them is, *to believe in his Gospel;* and that is comprised in one word only, Love: the grand and only principle on which the whole of his sacred doctrine is founded.

III. To produce the greatest effects possible, by the least efforts, is the highest perfection in nature, and at the same time the true characteristic of Divinity. God has given to all the beings that compose the universe, one simple principle alone, by which the whole, and every part, is connected and perpetually supported; and that is Love. The attraction of the celestial bodies, as well as of those of which our globe is formed, is a species of *love*; a mutual tendency toward each other. The uniform generation, by which all beings are perpetuated, is founded in *love*. This is the true *minimum*, the true system of *the least action*, which includes something so divine. It appears to be the will of God to establish, by the mouth of the Messiah, the same simple principle in morality, that is, in the rule of human actions, by saying, *Love:* in a word, it was his will, that in the conduct of mankind, as in every other part of nature, there should be no other principle than that of Love.

IV. That in the different systems of ethics of the ancient Heathen Philosophers many maxims and precepts of admirable morality are to be found, cannot be denied; but, beside that these philosophers are almost continually contradicting each other in their maxims, no one of their systems is founded on the true principle. In searching after it, they have discovered some excellent truths; but it has been by chance, and they are at best imperfect. Jesus Christ has alone taught mankind perfect morals, by deducing them from this true principle. Every principle should be simple: the ide of a compound principle implies at once an imperfection. Every principle should be comprehensive, even universal in its effects. Every principle, whose effects are limited, is imperfect. God himself is uniform in his principle, and infinite in his effects. His doctrine, or his law, should be the same. Jesus Christ has made known to mankind this principle, simple and universal. He has therefore been, in this sense also, the true Saviour of the world. He has preached to mankind; and his only doctrine has been that of love.

V. By the word Love, with regard to *Bodies* in general, is meant a tendency, a mutual inclination that urges them to join and to coallesce; and with regard to men in particular, a lively, affecting pleasure, that possesses the mind on contemplating the perfections of any object. This pleasure is always accompanied with a desire, either to possess that object, or to render it propitious. By adopting therefore this principle, and this last definition of *Love*, it follows, that all the duties of man consist,

1 In the love of God in preference to all other objects.

2. In the love of himself.

3. In the love of his own species.

4. In the love of every other creature to a certain degree.

The doctrines of Jesus Christ are, in these respects, the most explicit.

VI. From this principle flows our *duty* towards God, towards ourselves, our neighbour, and to those beings that are subject to our power. The first rule is, to communicate to all those, whom it is our duty to love, all the good, and to preserve them from all the evil in our power. The second, to do to no one what we would not have done to ourselves in similar circumstances. The third, which is the simple effect of love, is to endeavour to please the object that we ought to love. The fourth, to endeavour to render the pleasures that we communicate to others, as lively as possible, and those inevitable evils, which we are sometimes constrained to do to them, as supportable as we can; and so of the rest. The whole evangelic doctrine of our Saviour is replete, from beginning to end, with admirable precepts for these purposes; and these precepts, with their applications, general and particular, we learn from that science which we call Moral Theology.

VII. This doctrine we distinguish from moral philosophy, or the simple doctrine of Ethics; because Jesus Christ has made known, in his divine morality, a far greater degree of perfection than is discoverable by the mere light of human reason. For the renouncing of self-interest, and private pleasure; the forgiveness of offences; the love of his enemies; the triumph over destructive passions; and many other like virtues, the Christian is alone indebted to the doctrine of Jesus Christ.

VIII. In order to shew, moreover, in a few words, of how easy, just, and natural an application all these precepts are susceptible, we shall here give a few instances. "It is our duty to love God." Now nothing is more natural than to feel a lively and penetrating pleasure in the contemplation of the united perfections of the Supreme Being; nothing more natural than a desire to please him, and to render him propitious to us: and as it is not possible for us, weak creatures, to do him either good or evil, all our power to please him consists in offering him an upright heart; a rational devotion; to be possessed with gratitude toward him, and to exert all possible efforts to accomplish the end of our creation. "It is our duty to love all mankind;" and yet we inflict pains and chastisments on some of them; we even put them to death: but we chastise them only to render them better, to prevent them from becoming pernicious to society in general: we retrench the number of the living, as we cut off a corrupted branch of a tree, in whose preservation we are interested: it is because we love mankind, that we endeavour to prevent the destruction of the good by the malignity of the wicked: but it must ever be an indispensible necessity alone that can compel us to chastisement. "It is our duty, likewise, to feel a kind of love for other creatures, even for mere animals." Nevertheless we harrass, we oppose, we destroy them. If we harrass them wantonly, to support a criminal luxury, or to satisfy a brutal pleasure; if we pursue a savage chace, or encourage combats between animals themselves, or other like horrible diversions, we act contrary both to the spirit and the letter of the Gospel. But if we destroy a part of these animals, to serve as an indispensible nourishment to man, observing at the same time to put them to the least misery possible, and taking all necessary care for the preservation of the species, we act in conformity to the laws of nature and of morality; we employ to our own preservation, and to that of the rest of mankind, what appears destined to that purpose by the Creator.

IX. Moral theology likewise differs from philosophy, inasmuch as it requires that our virtues be absolutely disinterested: it enjoins us to fly the evil, and to pursue the good, merely as our duty towards God: it admits indeed the precept of the love of ourselves, and the love of our neighbour; but

but it regards this love only as a duty that results from our love towards God; and that from the principle, That God must love all his creatures as the work of his hands; and that we cannot therefore, from the very nature of love, please him, without entertaining sentiments of affection towards those to whom the Sovereign Lord of the Universe vouchsafes his benign regard. Now, as the Christian morality does not regard virtue, but as it is a duty towards God; and as it considers all our actions, that have any other motive, either as blameable, or at least imperfect, and as but little acceptable to the Supreme Being; it does not regard the advantages that result from them to society, but as useful consequences of the true Christian virtue; and from this principle it draws new arguments for the encouraging of mankind to the practice of it.

X. From what has been said, a second difference arises between Christianity and philosophy. The first adds to the second still new motives to the practice of virtue. That of redemption, and pardon, obtained by Jesus Christ, is not one of the least. Its argument is this: If God has so loved mankind, as to afford them the means by which the evil, caused by their own fault, may be abolished, it would be the greatest of all ingratitude and malice towards himself, if man should not endeavour to acknowledge this love, to merit it, and to embrace the means of pleasing God. A third motive, taken also from the merit of Jesus Christ, here offers itself as an auxiliary to the two former: According to the Christian doctrine, man has not by nature the power to practise all those virtues which are agreeable to God: but the same doctrine teaches, on the other hand, the conditions by which it is possible to please that most holy and perfect Being; and gives the Christian hope also, that he shall never labour in vain.

XI Lastly, the Christian morality is of far greater efficacy in adversity, than philosophy: it carries with it a wonderful consolation in misfortune, and even in the hour of death; for the Christian may say, with the Apostle, *that godliness* (or the practice of evangelic morals) *is in all things profitable, having the promise of the present life, and that which is to come.*

Of Polemic Theology, *or* Controversy.

I We cannot sufficiently lament, that the church of the God of peace should be a *church militant*; and that a doctrine so simple aud clear as that of the Gospel should be the cause of discord, even among Christians themselves. Nevertheless, as the truth is so difficult to discover in all things, and especially in matters of religion; as it is so frequently covered with the clouds of interest and ambition; as the same object appears so different to different men; and as error, in the face of the world, constantly assumes the mask of truth; it is but just that the true religion be furnished with arms to combat error, and to pluck off that deceitful mask by which so many poor mortals are seduced.

II. The theologian, who has made the proper preparatory studies, who is thoroughly instructed in natural religion, in the dogmatic and the hermeneutic, and who joins to these sound logic, is already well prepared for this spiritual combat: he is armed, but he is still to learn how to use these arms: he must also be made acquainted with the enemies he is to encounter, to know their force, and the arts they will use against him. It is plain enough, we suppose, that we here speak of spiritual arms; of those with which we are furnished by reason and the Holy Scripture: evil be to him that employs any other: force is ever an infallible proof of the want of argument. The propagation of a religion by the sword, after the manner of Mahomet; persecutions, either secret or open; constraint, violence, every sort of religious war, is so atrocious, so contrary to the spirit of the Gospel, in a word, so detestable, that every true Christian must avert his sight from such infamous horrors.

III. Controversy is conducted, either from the pulpit or chair, by way of harrangue, by conversation, or by writing. The first quality that is necessary to a disputant is *reason*, and the next *moderation*; in what manner soever the contest is conducted, these two qualities should constantly be manifest, during the whole course of altercation.

IV. There are some errors that attack the *system* of religion, and there are others that attack even its *morality*. In order properly to oppose an error, we must begin by finding out its real meaning: we must therefore study the different systems of other religions, and the principal heresies, if we would successfully refute them. We don't mean by this, that the theologian should know all the errors that spring up in the brain of each individual; we speak only of those that are professed by whole sects.

V. They who attack our religion, found their opinions, either on the interpretation of the sacred text, or on philosophy, or history; and we should always oppose them with the same arms with which they pretend to defeat us. It is necessary to begin by divesting ourselves of all prejudice, in order the better to shew others those prejudices by which they are deluded. We should never make use, but especially when we oppose weak minds, of opprobrious terms in the course of the debate, nor contend about words or expressions, nor attack incidental circumstances that may attend erroneous principles; but bend our whole force against the root of the tree, the principal error; to uncover it, to dig it up, to destroy it.

VI Polemic theology is taught in universities by two methods, according to the views of the student. If he learn it merely in order hereafter to defend his parishioners against the most prevalent errors, he is only to examine the principal controversies according to the systematic order of theology; and may content himself with knowing their true meaning, together with the arguments of those that oppose them. But if it be his intention to teach this science to others, or to engage in controversy, either by conversation or writing; in short, if he aspire to renown in it, he should study the origin and history of each controversy, he should make himself a complete master of the arguments for and against it, the exceptions that it makes, its interests, its different revolutions and actual state, *&c.* These follow, in this study, either the order established in the dogmatic, or that which is used in symbolic books, that is, such as treat on articles of faith.

VII. In order the better to elucidate the method to be observed in this sort of study, we shall say, that to acquire a complete knowledge of theological disputes, the student should, 1. Make the examen of each religion, and even of each controversy. 2. He should thoroughly examine his system in the symbolic books, and likewise the sources of his religion. 3. He should precisely determine the principal and capital error of each religion, sect, or individual; that which is the source from whence all the other errors flow. 4. Search into the political causes of each error, and each

each controverfy, from hiftory. 5. Examine the natural order according to which all the errors have taken their rife, the one from the other: and laftly, 6. Confront the refpective arguments, the anfwers, and exceptions, that each party has made to defend its caufe. To all this is to be added, 7. What they call *Collegium difputatorium*; an exercife, by which all that is learned in the clofet and in the fchools is called forth and animated, under the infpection of a profeffor; and the mind is accuftomed to think, and the tongue to fpeak, with facility and efficacy.

VIII. The principal contefts in which the theologian may be engaged, are, 1. Againft thofe who admit of no revealed religion; as the atheift and deift. 2. Againft thofe who admit of a revealed religion, but adopt not the true Revelation; as the Heathens, the Mahometans, *&c.* 3. Againft thofe who believe only a part of the true Revelation; as the Jews. 4. Againft thofe who add to the true Revelation matter foreign to it; as traditions, *&c.* 5. Againft thofe who make a falfe interpretation of the facred text, and draw from it erroneous fyftems; as the heretics and the fchifmatics, *&c.* And laftly, 6. Againft thofe who make a wrong ufe of certain expreffions of Revelation, and build, on whimfical notions, ridiculous fyftems; as the Fanatics, Quakers, *&c.*

IX. According to this divifion, the theologian will have to combat principally with,

1. The Atheifts, with Spinofa at their head.
2. The Deifts.
3. The Heathens and Idolaters.
4. The Mahometans.
5. The modern Jews.
6. The Arians and Manicheans, or rather thofe who in thefe days follow their ancient errors.
7. The Socinians.
8. The Catholics, oppofed to the Proteftants.
9. The Proteftants, oppofed to the Catholics.
10. The Molinifts, oppofed to the Janfenifts.
11. The Janfenifts, oppofed to the Molinifts.
12. The Reformed, oppofed to the Lutherans.
13. The Lutherans, oppofed to the Reformed.
14. The Arminians.
15. The Anabaptifts.
16. The Weigelians.
17. The Quakers or Tremblers.
18. The Fanatics, at the head of whom is Jacob Bohm.
19. The pretended new Prophets.
20. The Indifferents.
21. The Pietifts.
22. The Moravian Brethren, or the Herenhuters, *&c.*

X. Now, as each of the religions, communions, or herefies above mentioned, have not fcrupled to publifh to the world their dogmas and creeds, the theologian ought carefully to inftruct himfelf in thofe fymbolic books, in which each of them have comprifed its fyftem; to ftudy and to make a good analyfis of them; and to prepare fuch arguments as are the moft juft, the moft weighty, and proper to confute them.

XI. Before we quit this fubject, there is one remark to be made, or rather one caution that is very effential, which we would offer to the young theologian; which is, that the polemic is ufeful, and even neceffary in the ftudy of theology in general; but that it is a difcipline which ought to be treated with great prudence and moderation. Difputation in general is a dangerous art; and religious difputation is a deceitful art, and of infinite peril. The ftudent will do right well to remember, that there is no fect, no communion on earth, that is perfectly true in all its dogmas without exception; that there are fome fmall errors in all religions; that infallibility never was, nor ever will be, the portion of humanity. He fhould likewife remember, that the mafters who teach him, or the books that he reads, are conftantly partial to the religion they profefs: and that when he has fupported a thefis, and confuted his adverfaries in a collegial difpute (where his adverfaries, as well as his preceptors, are of the fame fide of the queftion, and will not fail to adjudge him the victory,) he fhould be perfuaded, that the victory would not have been fo eafily obtained had he contended with able adverfaries of the oppofite religion: he fhould remember, that we triumph without glory when we combat without danger; and let him not be vain of his laurels, nor imagine himfelf fome wonderful fcholar; feeing that it is very poffible, that he may go off victorious from fuch a difpute, that he may receive vaft applaufe from his profeffors and his colleagues, and at the fame time have reafoned like a dolt.

XII On the other hand, the moft able theologians, and the moft confummate profeffors in this fcience, ought to be conftantly on their guard againft the abufe of polemic theology; which frequently ferves lefs to clear and confirm the truth of the dogmas of a communion, than to eftablifh perpetual difcord and hatred among Chriftians. Every theologian fhould alfo remember, that by the nature of the fubject, it is not poffible to produce *demonftration* in fupport of his thefes and opinions; but that his arguments will be only valid, and preponderate in proportion to their degree of evidence; and laftly, that it is a ridiculous and infufferable vanity to imagine, that every man, who does not think precifely as we do, is guilty of palpable error.

Pastoral Theology.

I. Having defcribed the theoretic fciences of theology, we now come to thofe which regard the practice. It would be to bury the talents that God has given him, and the ftudies that he has made, if the theologian did not employ them to the edification of his neighbour, and the profperity of the Church. His office in fociety is attended with conftant and anxious labours. He is charged with the *cure of fouls*, with the inftruction of youth, with preaching of the Gofpel, the conduct of his flock, and the adminiftration of the Sacraments, with vifitations to the fick and the dying, with calming the terrors of weak minds, with adminiftring comforts to afflicted fouls, and many other functions equally difficult and important. The practical fciences that we fhall here defcribe, will ferve him as guides in this unbounded field.

II. Paftoral theology is ufually divided into three parts; which are,

1. Homilitic Theology.
2. Catechetic Theology.
3. Cafuiftic Theology.

To which are added,

4. The Confiftorial Prudence.
5. The prudential Exercife of the different functions of the miniftry.

As

As the homily makes a part of eloquence, it is unnecessary to say any thing of it in this place, but treat the others in their order.

III. It is in vain that a son of the church possesses all the sciences that belong to his profession, that he is an agreeable and even a renowned preacher, if he do not give a life, an efficacious spirit, to his ministry, by a *good example*; for that is the first precept in pastoral theology. He is at the head of a flock, and ought to be their guide: but how absurd, if his words and his actions be at continual variance with each other! How scandalous, if he be not the first to practise these lessons of wisdom that he preaches! How indecent, if, while he edifies by his discourses, he disgusts by his morals! What baseness, if he should even glory in his irregularities! It is less shameful for a soldier to relate that he has tamely suffered an affront, than for an ecclesiastic to boast of his debaucheries! Both the one and the other is a disgrace to his profession.

IV. But this exemplary conduct should be free from all affectation in the external behaviour. A singularity of dress, and an air of austerity; the head declined, the eyes turned up to heaven, the hands constantly clasped, a plaintive tone of voice, and a solemn gait; a scrupulosity in things indifferent, and a dogmatic and clerical manner of deciding in the common affairs of life; a ridiculous inclination to discover iniquity in innocent actions; to confound pleasure with vice, and to be an enemy to joy, the greatest boon that God has bestowed on man; and a hundred other like fopperies there are, with which the religious make a parade, that is shocking both to good sense and the evangelic morality, and which render their ministry, in the eyes of sensible people, more contemptible than respectable. These are rocks on which the young theologian is much too liable to run, and of which he cannot be sufficiently cautioned.

V. After this candid caution, and brief introduction, we pass to the examen of the differrent parts, the union of which composes the system of the pastoral, the most important article perhaps, in all theology. The design of Revelation was, without doubt, to conduct man by faith to a virtuous life. It is not the opinions or the learning of weak mortals that can determine their intrinsic merit; it is their wisdom, their regularity of conduct, that must stamp their value. Experience shews, that a man of great genius and learning may be also a great villain; one who is unable to please God, or his neighbour: the virtuous Christian, on the contrary, must be agreeable to both; it follows therefore, that the practical part of theology, which leads mankind to a virtuous conduct, is of all its parts the most important.

Catechetic Theology.

I. By Catechetic Theology is meant, *The art of teaching youth, and ignorant persons, the principal points of the Evangelical Doctrine, as well with regard to belief as practice.* This application of the theoretic sciences of theology ought to be conducted in the most simple manner possible. It is not every one who is possessed of the talent of properly composing and delivering catechetic instructions; and it is an art that is very necessary in the Christian church.

II. The greatest difficulty consists in separating the articles of faith that are absolutely essential and indespensable to the salvation of mankind, from those that are subtle and speculative, more liable to contradiction, and less necessary to such as do not make theology their profession. However, as children do not always remain children, and as the church is composed of persons of both sexes, and of all ages, it is necessary, that, in the explanations of the catechism, there should be employed different degrees of simplicity, proportioned to the age and capacity of those that are to be instructed. It is expedient for young people to retain in their minds the first principles of religion, such as are contained in good catechisms; and that they be explained to them in particular lectures; which is the most usual and most natural method of enabling youth to give an account of their faith. The sermons that are given in the catholic churches on controversy, and in protestant churches on the catechism, serve to instruct those who are of riper years and have their judgment more formed. These sermons compose, at the same time, a sort of course of the dogmatic and the polemic theology.

III Both in private catechising, and in sermons that are purposely intended to explain the catechism, the theologian should avoid, as much as possible, the use of technical terms; or (which is still better) he ought to begin by explaining those terms, of which he should give such clear and determinate definitions, that no person of a moderate capacity can possibly mistake them. In a word, he should endeavour more to prove than to persuade; and as eloquence sometimes persuades at the expence of truth, he should cautiously avoid that sort of delusive persuasion, and in its room substitute clear and solid argument.

IV. The catechumen should not only be instructed in the tenets of his own religion, and the foundations on which they are built, but also in the dogmas of other religions, and the proofs that are brought to maintain them: for a subtle, deceitful and specious book may fall into his hands, or he may be drawn into a dispute with an able adversary. It is necessary, therefore, that he be provided with arms offensive and defensive, that he may be able successfully to defend himself; and, if it may be, to convert his antagonist, and by that mean promote the glory of truth and of religion. It is the part, therefore, of his preceptor, to teach him faithfully the principal tenets of other religions, and the arguments that are brought to defend them.

Of Casuistic Theology.

I. Happily for man, and for society, all are not so obstinate, or so insensible, as to ask, *what sort of animal conscience is*, or never to know what is remorse. Happily, the greatest part of mankind are sensible, that all their actions are not conformable to the laws of divine wisdom, nor to the rules of natural equity; are afflicted at their past conduct, and find a generous and earnest desire arise in their souls to avoid for the future those dangerous rocks. To calm the troubled mind; to appease the timorous conscience; to communicate the consolations of grace to the afflicted soul; to explain and decide in doubtful cases; to direct those that err, and to support their weakness; to convince such as persist in their errors; to pierce the hardened heart; to intimidate the wicked, and to rouse the indolent; to conduct the Christians, committed to the care of their pastor, in the way that leads to true felicity; are the important objects of casuistic theology, and for which it affords the proper instructions.

II. In a more confined sense, by casuistic theology is meant, the science that decides in doubtful cases of moral theology,

theology, and that calms the fcruples of confcience which arife in the Chriftian's foul during his fojourn in this world.

III. The ftudies relative to thefe objects, which the theologian is fuppofed to have made, and the confidence that the common rank of Chriftians place in their paftors, afford them the means and the opportunities of rendering fignal fervice to thofe of their fellow citizens who have need of their counfel and confolation: for where there is one man of a philofophic fpirit, one Chriftian of a well-grounded knowledge in theology, there are in a fociety a thoufand that are not, and who are yet defirous of being inftructed, guided, comforted, eftablifhed. It is therefore both juft and important, that he who devotes himfelf to the fervice of the altar, fhould early ftudy all thofe fciences that will enable him worthily to perform this important part of his miniftry.

IV. God forbid, however, that we fhould countenance the abufe that is made, in fome Chriftian countries, of the duties that we have here explained. To reduce thefe matters into a political fyftem; to make the direction of confciences a profeffion, a regular trade; to provide each houfe with a fpiritual director, as with a butcher or baker, a fteward or porter, who by that mean may infinuate himfelf into the confidence of families, and become the depofitory of all their fecrets; may fometimes fow difcord between hufband and wife, or the neareft relations; who may avail himfelf of the confidence of his devotees, to direct them conftantly in matters of a worldly, and fometimes even of a criminal nature; to efface the legitimate and facred authority of the father of a family, and, in its place, to fubftitute a foreign power; to undermine the confidence, the union and concord of families, in order to confirm and render neceffary this fecondary authority; to captivate the fpirit, and oft-times the heart of a wife or daughter, and in general of weak minds; to enjoin them ridiculous mummeries that lead to fanaticifm, and a thoufand dangerous fuperftitions, or to religious exercifes that divert them from their domeftic duties; in a word, to affume an abfolute authority over the confciences of mankind, is a pernicious invention, contrary to the evangelic moral, to the welfare of fociety, to the intereft of the ftate, and to the fovereign authority; and well deferves an exemplary punifhment.

V. But the cure of fouls, faithfully intended, and properly limited, differs totally from this defpotic power. He, who is charged with it by a lawful vocation, fhould remember that there are four claffes of men with whom he will be engaged: 1. With thofe of weak minds; of little knowledge, and little ability. 2. With thofe whofe fpirits are afflicted by fome great reverfe of fortune. 3. With thofe of nice and timorous confciences, who fuffer by their fcruples, whether they be vain or rational. 4. And laftly, the wicked, the hardened and incorrigible finner. The grand art here confifts in reprefenting to each of thefe claffes of men, the truth, in a manner fo clear, fo ftrong and full, that they can no longer retain any doubts, that conviction muft take place, and confolation or converfion be the confequence.

VI. Truth is in its nature highly problematic: each one, however, is perfuaded that he knows it, that he poffeffes it, and is guided by it; every man thinks himfelf in the right. We fhould therefore begin by difcovering the truth in the fubject before us, and in placing it upon a folid foundation. This bufinefs of demonftrating the truth to others, is attended in the mean time with infinite difficulty. Every mind is not capable of difcovering it at the firft glance; nor can all difcern it from the fame point of view. Sometimes men require conviction by abftract or philofophical arguments, and fometimes by the exprefs decifions of the Holy Scripture. Sometimes by authority, fometimes by gentle remonftrance, and fometimes by dreadful menaces. Sometimes they are to be reclaimed by properly expofing the neceffary and fatal confequences that refult from their conduct; and at others, by the alluring promifes of the Gofpel. Now vice is to be boldly confronted; and now the tranfgreffor is to be conducted into the right path by artful turnings: now the finner's crimes are to be painted in the ftrongeft colours; and now a veil is to be lightly caft over them; and fometimes we fhould even indulge a favourite inclination, in order to induce them to abandon a more pernicious paffion: and fo of the reft.

VII. As it is impoffible that the books which have been wrote on this fubject, though of an immenfe quantity, can contain every cafe that daily occurs in the miniftry of the Gofpel; and as thefe cafes are not always juftly decided by thefe authors; and, if they were, the confulting of fuch enormous works would take up too much of a theologian's time, and divert him from his other ftudies; and as thefe cafuiftic writers contain, moreover, a number of puerile fubtilties, and wretched chimeras; it is highly proper that the minifter of the altar, whom we fuppofe to have a mafterly knowledge of the principles, the dogmas, and moral of the Chriftian religion, fhould endeavour to draw from the true fource the means that he is to employ on each occurrence, and not have recourfe to books for their decifions. For which purpofe it is neceffary, 1. That he accuftom himfelf to reafon according to the rules of found logic. 2. That he learn to know the human heart, under its different difguifes; the characters of men, their arts, and ruling paffions. 3. That he do not attempt to gain or convince by little pious frauds, or by lucky fophifms artfully reprefented. 4. That he do not inflict what are called penances, which are the height of abfurdity. 5. That he do not enjoin mummeries, pilgrimages, aufterities, and a thoufand like matters, which can never carry with them a real conviction, and only ferve to divert men from their labours and the duties of fociety. But, 6. That he conftantly prefent, as we have before faid, and cannot too often repeat, the truth, in all its native force and purity.

VIII. This truth, however, is no enemy to facred eloquence; on the contrary, the latter ferves to introduce the former into the mind of the auditor, and there to give it fuch ftrong impreffions, as neither time, the diffipations of the world, nor the diftractions of fortune, are able eafily to efface. The whole minifterial function confifts in teaching, preaching, adminiftering the facraments of the church, vifiting the fick and the dying, comforting the afflicted, and affording the fpiritual aids to all thofe who have need of them. Eloquence is of the greateft efficacy in all thefe functions; and, without affecting it, the minifter of the gofpel fhould never neglect it. There are fome profeffors in univerfities who give their auditors a complete fyftematic courfe on paftoral theology, which may be attended with many advantages.

Consistorial Prudence, *or* General Oeconomy *of the* Church.

I. Among the practical fciences of theology, we muft not

not paſs over in ſilence that which is called the Conſiſtorial or Eccleſiaſtic Prudence; whoſe object is the exterior order or arrangement of the Chriſtian church, on principles founded on the Holy Scriptures; and which are proper, not only to maintain religion in its purity and ſplendor, but to defend it againſt all ſchiſms, diſſenſions and ſeparations whatever. This œconomy is neceſſary in the councils, the ſynods, the conſiſtories, and in the faculties of theology. We muſt not, however, confound this with the eccleſiaſtic juriſprudence, which is the ſcience of interpreting and applying the laws, inſtituted by the ſovereign, relative to the perſons, goods, and affairs of the church; whereas the object of conſiſtorial prudence is the arrangement of the church itſelf, and the eccleſiaſtic ſtate, on Chriſtian and rational maxims. The one is a ſort of legiſlation in itſelf; and the other, on the contrary, an application of the civil laws.

II. The theological prudence includes therefore, firſt, the whole plan of church-government, and the arrangement of the eccleſiaſtic ſtate; ſecondly, the ordinances relative to exterior ceremonies, and divine worſhip; and laſtly, the diſcipline of the church, the errors, the ſchiſms, the hereſies, and diſſenſions that ariſe among Chriſtians. The ſource of this prudence is a thorough knowledge of the eſſence of the Chriſtian religion, and the method of drawing from it juſt conſequences.

III. This diſcipline is likewiſe employed in deciding, Wherein conſiſts the difference between the clergy and the laity; or if there be, in fact, any real difference between them: if the church form a diſtinct ſtate in the general ſyſtem of government; and to whom belongs the right of deciding *circa ſacra*; and what are the limits of the ſpiritual and temporal powers in this reſpect: wherein conſiſts the hierarchy of the church, and what are its rights and privileges: to whom appertains the nomination of a prieſt, or other eccleſiaſtic, according to the divine ordinance: to whom is committed the right of preaching in public, of adminiſtering the ſacraments, and of exerciſing the excommunicative power of expelling, or again admitting, any particular Chriſtian, or even a whole country, into the pale of the church: the bans and interdicts; the exerciſe of ſacred or theologic ſtudies; the ſchools, the ſeminaries, the univerſities and academies, the claſſes, the convents; and ſo of the reſt: all ſubjects vigorouſly attacked and obſtinately defended.

IV. The conſiſtorial prudence examines likewiſe the liturgies, the ceremonies and religious cuſtoms, the breviaries, the rituals, the canticles, and other books of devotion adopted by the church; the formularies, the ſubjects of diſcipline, &c. &c. the creeds, the confeſſions of faith, the catechiſms, and many other like matters; and laſtly, the doubts and objects of controverſy, that occaſion the holding of ſynods and councils; the queſtion, if the Pope be above the councils, or the councils above the Pope; the practice of elenchtic theology, or the public elenchy; the ſeparation and reunion of the church, which the Syncretiſts and Irenians diſpute; the divorces more or leſs allowable; matrimonial, and conſiſtorial matters, &c. &c.

V. All theſe ſubjects, and an infinity of others, which ariſe from, or have an immediate connection with theſe, require to be thoroughly conſidered, reduced into a regular ſyſtem, explained and fixed on ſolid principles, and confirmed by juſt and pertinent examples. From all this reſults what is called Eccleſiaſtic Prudence. This ſcience has not yet been reduced into a ſyſtem or formal diſcipline, and that principally becauſe it has been conſtantly confounded with the eccleſiaſtic law: but that in reality differs as much from this, as political prudence differs from the common law.

Of THEOLOGIC PRUDENCE *in the* DIFFERENT FUNCTIONS *of the* MINISTRY.

I. INDEPENDENT of caſuiſtical theology, and of the œconomy of the church in general, the theologian has, moreover, need of great ſagacity in the particular exerciſe of his miniſtry; and many able divines have reduced this ſcience into a ſyſtem, and have given general precepts, and particular rules, for the conduct of the miniſter of the altar, in the different circumſtances that may ariſe in this part of his duty. We ſhall decline the particular explanation of theſe different ſyſtems, as it would lead us into numberleſs *minutiæ*. *Conrad Porta* has wrote a work on the ſubject, intitled *Paſtorale Lutheri;* Stoltzelinus, Kortholt, Philip Hahn, Hartman, and many other theologians, have wrote large volumes concerning it; but, above all, the treatiſe of *Dr. John Mayer*, which is called *Muſæum Miniſtri Eccleſiæ*, is to be conſulted on this matter. We the more readily omit the names and titles of other works of this kind, as we have preſcribed it to ourſelves as a law, to avoid, as much as poſſible, theſe ſorts of citations, ſeeing that the number of new books that are continually appearing frequently ſuperſede their predeceſſors; and moreover, in this part of theology, each Chriſtian communion has its particular authors, who treat it in conformity to the dogmas and principles which that communion adopts.

II. The humour of reducing every thing into ſyſtem, has alſo taken place in this matter, which in fact appears to have no occaſion for any peculiar diſcipline that could not be included under ſome other part of theology. But as this diſtinction is already made, it is our buſineſs to explain it, for the uſe of ſuch as devote themſelves to the altar. The prudential theology is, for them and their miniſtry, what political prudence is for a man of the world in the commerce of life. It is the art of attaining the end propoſed: and as each condition in life has its particular purſuits, the divines have alſo naturally theirs, and the precepts of theologic prudence ſerve to conduct them to it.

III. But as the dogmas, the ceremonies, the rites and objects that the miniſters of the different Chriſtian communions propoſe to themſelves, are by no means the ſame, each communion, each ſect, does not follow, in this reſpect, the ſame rules and precepts, nor even part of the ſame principles. All that we can therefore do amidſt this diverſity of opinions, and contrariety of maxims, is to point out, in a few words, the principal objects that one or other of them comprehend in this part of their paſtoral theology.

IV. The *Aſcetic Theology*, for inſtance, treats of the various particular exerciſes of piety; and the principles, that it propoſes with this regard, ſerve as guides to the miniſter of the altar, in his recommendation of the practice of it, as well as in many parts of his eccleſiaſtic duty. Faſts, pilgrimages, and many other matters of the ſame kind, belong to the province of aſcetic theology, and which we will not abſolutely reject, becauſe we write for readers of all ſorts of communions. Truth, however, obliges us to remark, that the aſcetic theology of every communion is the offspring of principles falſely attributed to the Goſpel, and belongs

belongs much more properly to superstition than religion. The monastic life, of which there is not the least trace to be found in the Holy Scriptures, and which is so contrary to the wisdom and goodness of God; the contemplative life which is employed merely in theoretic and barren speculations, and which is a continual impediment to the practice of the duties of a citizen, and of the social virtues; the corporal chastisements that the pious visionary inflicts on himself, and a thousand like absurdities, are the fruits of fanaticism, and the essence of ascetic theology.

V. Under this head may be also included, confession and absolution, which are modern inventions, and of which there is not the least vestige to be found in the Gospel, and which were unknown to Jesus Christ and his apostles; unless we would torture and disguise the text, and make a strange abuse of words, and of phrases the most simple: inventions, in short, that are more politic and lucrative than divine. Be that as it may, the ascetic theology prescribes general maxims relative to confession and absolution, and particular precepts for the priests of the confessional.

VI. The *Paracletic Theology*, on the contrary, is totally employed in preparing consolations against plagues and other public calamities and adversities, and against the most considerable evils that befall individuals. It considers, examines, and directs these consolations, and points out the proper method of applying them. As it is the business of ascetic theology to humble and intimidate the Christian, and to subject him to all sorts of pious and painful bodily exercises, so it is that of paracletic theology to reanimate his courage and his faith, and to administer consolation to his soul.

VII. The five doctrines of which we have here treated, to wit, the Homilitic, Catechetic, and Casuistic Theology, and the Consistorial and Theologic Prudence in the ordinary exercise of the ministry, form therefore what is called, in a collective sense, *Pastoral Theology*; a science on which many authors, of all communions, have wrote vast treatises; in which complete courses are made at universities, by the faculties of theology; which is reduced into a regular system; and which, in fact, forms not one of the least parts of that science which is necessary to an able and faithful theologian who undertakes the cure of souls.

VIII. We think we have said enough to give an idea of those sciences that compose the general system of theology. We are not ignorant, however, that there are theologies established in the schools, still different in their genus and species: that they distinguish, for example, 1. The Theology of God, (Theologia Dei), 2. That of Jesus Christ, 3. That of the Holy Ghost, 4. That of Angels, and 5. That of Men: that they again sub-divide the Theology of God, 1. Into *Theologia Dei naturalis*, or *essentialis*, by which is shewn, that God perceives *simul et semel*, once and for ever, all that is contained in his essence; and 2. *Theologia Dei idealis* or *exemplaris*, which considers those things that must be revealed to mankind to work their salvation: this last article is again divided into *Archetypic Theology*, which teaches what comes, in this respect, immediately from God himself; and *Ectypic Theology*, which considers the theologic notions that man, as the image of God, is able to acquire by his own nature, that is, by the ability he has received from the Supreme Being, to know and adore him, and by the preaching of his divine word. But we should never have done, were we to relate all the distinctions, divisions, and subdivisions, &c. that men, fond of systematic forms, have introduced into all the sciences: divisions whose whimsical denominations busy and embarrass the mind that ought to be more usefully employed in attending to realities; and which constantly savour of that pedantry which insinuates itself, more or less, into the study of every science.

REMEMBRANCE. See Memory.

REMEMBRANCERS, anciently called clerks of the remembrance, certain officers in the exchequer, whereof three are distinguished by the names of the king's remembrancer, the lord treasurer's remembrancer, and the remembrancer of the first fruits. The king's remembrancer enters in his office all recognizances taken before the barons for any of the king's debts, for appearances or observing of orders; he also takes all bonds for the king's debts, &c. and makes out processes thereon. He likewise issues processes against the collectors of the customs, excise, and others, for their accounts; and informations upon penal statutes are entered and sued in his office, where all proceedings in matters upon English bills in the exchequer-chamber remain. His duty further is to make out the bills of compositions upon penal laws, to take the statement of debts; and into his office are delivered all kinds of indentures and other evidences which concern the assuring any lands to the crown. He, every year in crastino animarum, reads in open court the statute for election of sheriffs; and likewise openly reads in court the oaths of all the officers, when they are admitted.

The lord treasurer's remembrancer is charged to make out process against all sheriffs, escheators, receivers, and bailiffs, for their accounts. He also makes out writs of fieri facias, and extent for debts due to the king, either in the pipe or with the auditors; and process for all such revenue as is due to the king on account of his tenures. He takes the account of sheriffs; and also keeps a record, by which it appears whether the sheriffs or other accountants pay their proffers due at Easter and Michaelmas: and at the same time he makes a record, whereby the sheriffs or other accountants keep their prefixed days: there are likewise brought into his office all the accounts of customers, comptrolers, and accountants, in order to make entry thereof on record: also all estreats and amercements are certified here, &c.

The remembrancer of the first-fruits takes all compositions and bonds for the payment of first-fruits and tenths; and makes out process against such as do not pay the same.

REMINISCENCE, that power of the human mind, whereby it recollects itself, or calls again into its remembrance such ideas or notions as it had really forgot; in which it differs from memory, which is a treasuring up of things in the mind, and keeping them there, without forgetting them.

REMISSION, in physics, the abatement of the power or efficacy of any quality.

Remission, in law, &c. denotes the pardon of a crime, or the giving up the punishment due thereto.

REMITTANCE, in commerce, the traffic or return of money from one place to another, by bills of exchange, orders, or the like.

REMONSTRANCE, an expoftulation or humble fupplication, addreffed to a king, or other fuperior, befeeching him to reflect on the inconveniences, or ill confequences of fome order, or the like. This word is alfo ufed for an expoftulatory counfel, or advice; or a gentle and handfome reproof, made either in general, or particular, to apprize or correct fome fault, *&c*

REMORA, in ichthyology. See ECHENEIS.

ACTION OF REMOVING, in Scots law. See LAW, Tit. xiii. 16.

REMPLY, in heraldry, fomething filled up. The term is chiefly ufed to denote that the chief is quite filled up with a fquare piece of another colour, leaving only a bordure of the proper colour of the chief about the faid piece. See Plate CXLVII. fig. 8.

RENAL, fomething belonging to the reins or kidneys. See ANATOMY, p 268.

RENCOUNTER, in the military art, an engagement of two little bodies or parties of forces; in which fenfe it ftands in oppofition to a pitched battle. See BATTLE.

RENCOUNTRE, or RENCONTRE, in heraldry, is applied to animals when they fhew the head in front, with both eyes, *&c.* or when the face ftands right forward, as if they came to meet the perfon before them.

RENDEZVOUS, a place appointed to meet in at a certain day and hour.

RENEALMIA, in botany See TELLANDSIA.

RENEGATE, or RENEGADO, a perfon who has apoftatized or renounced the Chriftian faith, to embrace fome other religion, particularly Mahometanifm.

RENFREW, a town of Scotland, the captital of the county of Renfrew, fituated on the river Clyde, forty-fix miles weft of Edinburgh.

RENIFORM fomething refembling the figure or fhape of kidneys

RENITENCY, among philofophers, that force in folid bodies, whereby they refift the impulfe of other bodies or re-act as much as they are acted on. See MECHANICS.

RENNES, a city of France, capital of the province of Britany, fituated on the river Villaine: W. long. 1° 45′, N lat. 48° 5′.

RENT, in law, a fum of money, or other confideration, iffuing yearly out of lands or tenements.

RENVERSE', INVERTED, in heraldry, is when any thing is fet with the head downwards, or contrary to its natural way of ftanding Thus, a chevron renverfé, is a chevron with the point downwards. They ufe alfo the fame term when a beaft is laid on its back.

RENUNCIATION, the act of renouncing, abdicating, or relinquifhing any righ , real or pretended

RENUNCIATION *by an heir*, in Scots law. See ADJUDICATION.

REPARTEE a ready fmart reply, efpecially in matters of wit, humour, or raillery

REPEALING, in law, the revoking or annulling of a ftature, or the like.

REPEAT, in mufick, a character fhewing that what was laft played or fung muft be repeated or gone over again.

REPELLENTS, in medicine, remedies which drive back a morbid humour into the mafs of blood from which it was unduly fecreted.

The moft remarkable in the clafs of repellents are the white of an egg, the lapis calaminaris, litharge of gum, red-lead, tutty, pampholix, houfe-leek, putty, and cow web.

REPETITION, the reiterating of an action.

REPETITION, in rhetoric, a figure which gracefully and emphatically repeats either the fame word, or the fame fenfe in different words.

REPLETION, in medicine, a plenitude or plethora. See PLETHORA

Right of REPLEDGING, in Scots law. See *Lord of* REGALITY.

REPRESENTATION, in the drama, the exhibition of a theatrical piece, together with the fcenes, machines, *&c.* See COMPOSITION.

REPRESENTATIVE, one who perfonates or fupplies the place of another, and is invefted with his right and authority. Thus the houfe of commons are the reprefentatives of the people in parliament.

REPRIEVE in law, is fufpending or deferring the execution of the law upon a prifoner for a certain time; or a warrant from the king for deferring the execution of a perfon condemned.

REPRISALS, a right which princes claim of taking from their enemies any thing equivalent to what they unjuftly detain from them.

REPROBATION, in theology, a decree by which God is fuppofed, either from all eternity, or from the creation of the world, to confign over to eternal mifery the greateft part of mankind, and to fave none of the human race, except thofe whom he made the heirs of glory by election.

REPROBATOR, in Scots law. See LAW, Tit. xxxi. 14.

REPRODUCTION, the act whereby a thing is produced anew, or grows a fecond time.

The reproduction of feveral parts of lobfters, crabs, *&c.* is one of the greateft curiofities in natural hiftory. It feems, indeed, inconfiftent with the modern fyftem of generation, which fuppofes the animal to be wholly formed in the egg; that, in lieu of an organical part of an animal cut off, another fhould arife perfectly like it: the fact, however, is too well attefted to be denied. The legs of lobfters, *&c.* confift each of five articulations; now when any of the legs happen to break, by any accident, as by walking, *&c.* which frequently happens, the fracture is always found to be at the future near the fourth articulation; and what they thus lofe, is exactly reproduced in fome time afterwards, that is, a part of the leg fhoots out, confifting of four articulations, the firft whereof has two claws, as before; fo that the lofs is entirely repaired.

If the leg of a lobfter be broken off by defign at the fourth or fifth articulation, what is thus broke off is always reproduced. But, if the fracture be made in the firft, fecond, or third articulation, the reproduction is not fo certain. And it is very furprifing, that, if the fracture be made at thefe articulations, at the end of two or three days all the other articulations are generally found broke off to the fourth, which, it is fuppofed, is done by the creature itfelf, to make the reproduction certain. The part reproduced is not only fimilar to that retrenched, but alfo, in a certain fpace of time, grows equal to it. Hence it is that we frequently fee lobfters which have their two large legs unequal in all proportions; and, if the part reproduced be broken off, a fecond will fucceed.

REPTILES, in natural history, a kind of animals denominated from their creeping or advancing on the belly. Or reptiles are a genus of animals and insects, which, instead of feet, rest on one part of the body, while they advance forward with the rest.

Such are earthworms, snakes, caterpillars, *&c.*

REPUBLIC, commonwealth, a popular state or government; or a nation where the people have the government in their own hands.

REPUBLIC *of letters*, a phrase used collectively of the whole body of the people of study and learning.

REPUDIATION, in the civil law, the act of divorcing. See DIVORCE.

REPULSION, in physics, that property in bodies, whereby, if they are placed just beyond the sphere of each other's attraction, they mutually fly from each other. See ELECTRICITY, and MECHANICS.

REQUEST, in law, a supplication or petition preferred to a prince, or to a court of justice, begging relief in some conscionable cases where the common law grants no immediate redress.

Court of REQUESTS, an ancient court of equity, instituted about the nineteenth year of Henry VII. See COURT.

In the fortieth and forty-first years of queen Elizabeth, it was adjudged upon solemn argument, in the court of common pleas, that the court of request was then no court of equity.

REQUIEM, in the Romish church, a mass sung for the rest of the soul of a person deceased. See MASS.

REQUISITION, in Scots law. See LAW, Tit. xv. 8.

RESARCELE'E, in heraldry, is where a slender cross is charged upon another, as represented in Plate CXLVII. fig. 6.

RESCHET, the capital of the province of Gilan, in Persia, situated on the south-west coast of the Caspian sea.

RESCISSION, in the civil law, an action intended for the annulling, or setting aside, any contract, deed, *&c.*

RESCRIPT, an answer delivered by an emperor, or a pope, when consulted by particular persons, on some difficult question or point of law, to serve as a decision thereof.

RESEDA, in botany, a genus of the dodecandria trigynia class. The calix consists of one deeply cut leaf; the petals are laciniated; and the capsule has one cell. There are 11 species, two of them natives of Britain, *viz.* the lutea, or base-rocket; and the luteola, wild woad, or dyers-weed.

RESERVATION, in law, an action or clause whereby something is reserved, or secured to one's self.

Mental RESERVATION, a proposition, which, strictly taken, and according to the natural import of the terms, is false; but, if qualified by something concealed in the mind, becomes true

Body of RESERVE, or *Corps de* RESERVE, in military affairs, the third or last line of an army, drawn up for battle; so called because they are reserved to sustain the rest, as occasion requires; and not to engage, but in case of necessity.

RESERVOIR, a place where water is collected and reserved, in order to be conveyed to distant places through pipes, or supply a fountain, or jet d'eau.

RESET OF THEFT, in Scots law. See LAW, Tit. xxxiii. 29.

RESIDENT, a public minister, who manages the affairs of a kingdom or state, at a foreign court.

They are a class of public ministers inferior to ambassadors or envoys; but, like them, are under the protection of the law of nations.

RESIDUE, the remainder or balance of an account, debt, or any thing else.

RESIN. See CHEMISTRY, p. 94.

RESIGNATION, in Scots law. See LAW, Tit. xiv. 7.

RESISTANCE, or RESISTING FORCE, in philosophy, denotes, in general, any power which acts in an opposite direction to another, so as to destroy or diminish its effect. See MECHANICS, HYDROSTATICS, and PNEUMATICS.

RES JUDICATA, in Scots law. See LAW, Tit. xxxii. 4.

RES *Publica*, in Scots law. See LAW, Tit. viii. 2.

RES *Universitatis*, in Scots law. See LAW, *ibid.*

RES *Sacræ*, in Scots law. See LAW, *ibid.*

RESOLUTION, in chemistry, *&c.* the reduction of a mixed body into its component parts, or first principles, by a proper analysis. See CHEMISTRY, p. 100.

RESOLUTION, in medicine, that coction or alteration of the crude peccant matter of any disease, either by the natural strength of the patient, or of its own accord, or by the application of remedies, whereby its bulk, figure, cohesion, *&c.* are so far changed, as that it ceases to be morbid, and becomes laudable.

RESOLVENTS, in medicine, remedies proper to resolve and dissipate tumours and gatherings, to soften indurations, and, by their tenuity and warmth, evacuate redundant and peccant humours through the pores. Under this class come various unguents, emplasters, *&c.*

RESONANCE, RESOUNDING, in musick, *&c.* a sound returned by the air, inclosed in the bodies of stringed musical instruments, as lutes, *&c.* or even in the bodies of wind instruments, as flutes, *&c.* See MUSICK, and PNEUMATICS.

RESPIRATION, the act of respiring or breathing the air. See ANATOMY, p. 281.

RESPITE, in law, *&c.* signifies a delay, forbearance, or prolongation of time, granted any one, for the payment of a debt or the like.

RESPONDENT, in the schools, one who maintains a thesis, in any art or science; who is thus called, from his being to answer all the objections proposed by the opponent.

RESPONSE, an answer or reply. A word chiefly used in speaking of the answers made by the people to the priest, in the litany, the psalms, *&c.*

RESSAULT, in architecture, is the effect of a body which either projects or sinks back; that is, stands more out or in than another, so as to be out of the line or level with it.

RESSORT, a French word, sometimes used by English authors, to signify the jurisdiction of a court, and particularly one from which there is no appeal.

Thus it is said, that the house of lords judge en dernier ressort, or in the last ressort.

REST, the continuance of a body in the same place, or its continual application or contiguity to the same parts of the ambient or contiguous bodies; and therefore is opposed to motion.

REST, in poetry, is a short pause of the voice in reading, being

being the ſame with the cæſura, which, in alexandrine verſes, falls on the ſixth ſyllable; but in verſes of ten or eleven ſyllables, on the fourth.

RESTAURATION, the act of re eſtabliſhing or ſetting a thing in its former good ſtate.

RESTITUTION, in a moral and legal ſenſe, is reſtoring a perſon to his right; or returning ſomething unjuſtly taken or detained from him.

RESTITUTION *of medals*, or RESTITUTED MEDALS, is a term uſed by antiquaries, for ſuch medals as were ſtruck by the emperors, to retrieve the memory of their predeceſſor.

Hence, in ſeveral medals we find the letters REST. This practice was firſt begun by Claudius, by his ſtriking afreſh ſeveral medals of Auguſtus. Nero did the ſame; and Titus, after his father's example, ſtruck reſtitutions of moſt of his predeceſſors. Gallienus ſtruck a general reſtitution of all the preceding emperors, on two medals, the one bearing an altar, the other an eagle, without the REST.

RESTIVE, or RESTY, in the manege, a ſtubborn, unruly, ill-broken horſe, that ſtops, or runs back, inſtead of advancing forward.

RESTORATION, the ſame with reſtauration. See RESTAURATION.

In England, the return of king Charles II. in 1660, is, by way of eminence, called the Reſtoration; and the 29th of May is kept as an anniverſary feſtival, in commemoration of that event, by which the regal and epiſcopal government was reſtored.

RESTORATIVE, in medicine, a remedy proper for reſtoring and retrieving the ſtrength and vigour both of the body and animal ſpirits.

All under this claſs, ſays Quincy, are rather nutrimental then medicinal; and are more adminiſtred to repair the waſtes of the conſtitution, than to alter and rectify its diſorders.

RESTRICTION, among logicians, is limiting a term, ſo as to make it ſignify leſs than it uſually does.

RESTRINGENT, in medicine, the ſame with aſtringent. See ASTRINGENTS.

RESULT, what is gathered from a conference, inquiry, meditation, or the like; or the concluſion and effect thereof.

RESURRECTION, in theology, riſing again from the dead; or a perſon's returning to a ſecond life, with new bodily organs, adapted to the ſtate of its new exiſtence.

One of the greateſt arguments for the truth of Chriſtianity is drawn from the reſurrection of our Saviour; the circumſtances of which are handed down to us in ſo plain and diſtinct a manner by the evangeliſts, as make the evidence of this important truth amount to a demonſtration.

Chriſtians generally believe, that at the day of judgement, the very identical body they have now, with the ſame fleſh, blood, and bones, will be raiſed from the dead.

RESUSCITATION, the ſame with reſurrection and revivification. See the preceding article.

The term reſuſcitation however, is more particularly uſed by chemiſts, for the reproducing a mixed body from its aſhes; an art to which many have pretended, as to reproduce plants, *&c.* from their aſhes.

RETAIL, in commerce, is the ſelling of goods in ſmall parcels, in oppoſition to wholeſale. See COMMERCE.

RETAINER, a ſervant who does not continually dwell in the houſe of his maſter, but only attends upon ſpecial occaſions.

RETAINING FEE, the firſt fee given to a ſerjeant or counſellor at law, in order to make him ſure, and prevent his pleading on the contrary ſide.

RETALIATION, among civilians, the act of returning like for like.

RETARDATION, in phyſics, the act of diminiſhing the velocity of a moving body. See MECHANICS.

RETE MIRABILE, in anatomy, a ſmall plexus, or net-work of veſſels in the brain, ſurrounding the pituitary gland. See ANATOMY, p. 286.

RETENTION, is defined, by Mr Locke, to be a faculty of the mind, whereby it keeps, or retains, thoſe ſimple ideas it has once received, by ſenſation or reflection. See METAPHYSICS.

RETENTION is alſo uſed, in medicine, *&c.* for the ſtate of contraction in the ſolids or vaſcular parts of the body, which makes them hold faſt their proper contents. In this ſenſe, retention is oppoſed to evacuation and excretion.

RETIARII, in antiquity, a kind of gladiators, thus denominated from a net which they made uſe of againſt their antagoniſts, who were called ſecutores, and ſometimes mirmillones.

This net they carried under their buckler, and when opportunity ſerved, caſt it over the head of their antagoniſt, and in this condition killed him with a trident which they bore in the other hand.

RETFORD, a borough-town of Nottinghamſhire, ſituated twenty-five miles north of Nottingham. It ſends two members to parliament.

RETICULA, or RETICULE, in aſtronomy, a contrivance for the exact meaſuring the quantity of eclipſes.

The reticule is a little frame, conſiſting of thirteen fine ſilken threads, equidiſtant from each other, and parallel, placed in the focus of object-glaſſes of teleſcopes; that is, in the place where the image of the luminary is painted in its full extent: of conſequence, therefore, the diameter of the ſun or moon is hereby ſeen divided into twelve equal parts or digits; ſo that, to find the quantity of the eclipſe, there is nothing to do but to number the luminous and dark parts. As a ſquare reticule is only proper for the diameter, not for the circumference, of the luminary, it is ſometimes made circular by drawing ſix concentric equidiſtant circles. This repreſents the phaſes of the eclipſe perfectly.

Corpus RETICULARE, in anatomy. See ANATOMY, p. 255.

RETINA, in anatomy. See ANATOMY, p. 289.

RETINUE, the attendants or followers of a prince or perſon of quality, chiefly in a journey.

RETIRADE, in fortification, a kind of retrenchment made in the body of a baſtion, or other work, which is to be diſputed, inch by inch, after the defences are diſmantled. It uſually conſiſts of two faces, which making a re-entering angle, when a breach is made in a baſtion, the enemy may alſo make a retirade or new fortification behind it.

RETLINGEN, an imperial city of Germany, in the circle

of Swabia and duchy of Wirtemberg, situated in E. long. 9°, N. lat. 48° 18′.

RETORT, in chemistry. See CHEMISTRY, p. 110.

RETRACTS, among horsemen, pricks in a horse's feet, arising from the fault of the farrier in driving nails that are weak, or in driving them ill pointed, or otherwise amiss.

RETRENCHMENT, literally signifies something cut off or taken from a thing; in which sense it is the same with subtraction, diminution, *&c.*

RETRENCHMENT, in the art of war, any kind of work raised to cover a post, and fortify it against the enemy, such as fascines loaded with earth, gambions, barrels of earth, sand-bags, and generally all things that can cover the men and stop the enemy. See FORTIFICATION.

RETRIBUTION, a handsome present, gratuity, or acknowledgment, given instead of a formal salary or hire to persons employed in affairs that do not so immediately fall under estimation, nor within the ordinary commerce in money.

RETROCESSION, the act of going backwards; more usually called retrogression, or retrogradation. See the next article.

RETROCESSION *of the equinox.* See ASTRONOMY, p. 562.

RETROGRADATION, the act or effect of a thing moving backwards.

Retrograde motion of the planets. See ASTRONOMY, p. 448.

RETROMINGENTS, in natural history, a class or division of animals, whose characteristic it is that they stale, or make water, backwards, both male and female.

REVE, REEVE, or GREVE, the bailiff of a franchise, or manor, thus called, especially in the west of England. Hence shire-reve, sheriff, port-greve, *&c.*

REVEILLE, a beat of drum about break of day, to give notice that it is time for the soldiers to arise, and that the sentries are to forbear challenging.

REVEL, a port-town of Livonia, situated at the south entrance of the gulph of Finland: E. long. 24°, N. lat. 59°.

REVELATION, the act of revealing, or making a thing public that was before unknown: it is also used for the discoveries made by God to his prophets, and by them to the world; and more particularly for the books of the Old and New Testament. See BIBLE and RELIGION.

REVELATION *of St John.* See APOCALYPSE.

REVELS, entertainments of dancing, masking, acting comedies, farces, *&c.* anciently very frequent in the inns of court, and in noblemens houses, but now much disused. The officer who has the direction of the revels at court, is called the master of the revels.

REVENUE, the annual income a person receives from the rent of his lands, houses, interest of money in the stocks, *&c.*

REVENUE, in hunting, a fleshy lump formed chiefly of a cluster of whitish worms on the head of deer, supposed to occasion their casting their horns by gnawing them at the roots.

REVERBERATION, in physics, the act of a body repelling or reflecting another after its impinging thereon.

REVERBERATION, in chemistry, denotes a kind of circulation of the flame by means of a reverberatory. See CHEMISTRY, p. 112.

REVERBERATORY, or REVERBERATING FURNACE. See CHEMISTRY, p. 112.

REVEREND, a title of respect given to ecclesiastics.

REVERIE, the same with delirium, raving, or distraction. It is used also for any ridiculous, extravagant imagination, action, or proposition, a chimera or vision. But the most ordinary use of the word, among English writers, is for a deep disorderly musing or meditation.

REVERSE *of a medal, coin,* &c. denotes the second or back side, in opposition to the head or principal figure.

REVERSION, in Scots law. See LAW, Tit. xv. 1.

REVIVIFICATION, in chemistry. See RESUSCITATION.

REVOLUTION, in politics, signifies a grand change or turn in government. In which sense, the revolution is used, by way of eminence, for the great turn of affairs in England, in the year 1688, when king James II. abdicating the throne, the prince and princess of Orange were declared king and queen of England, *&c.* In geometry, the revolution of any figure, is its motion quite round a fixed line, as an axis.

The revolution of a planet, or comet, round the the sun, is nothing but its course from any point of its orbit till its return to the same. See ASTRONOMY.

REVULSION, in medicine, turning a flux of humours from one part to another, by bleeding, cupping, friction, sinapisms, blisters, fomentations, bathings, issues, setons, strong purging of the bowels, *&c.* See MEDICINE.

REYGATE, or RYGATE, a borough of Surry, twenty-two miles south west of London. It sends two members to parliament.

REZANSKOI, the capital of the province of Rezan, in Russia: east long. 41°, north lat. 55°.

RHAGADES, in medicine, denotes chaps or clefts in any part of the body; arising either from any aridity of the parts, or acrimony of the humours.

RHAMNUS, in botany, a genus of the pentandria monogynia class. The calix is tubulose, the scales fortifying the stamina; it has no corolla; and the fruit is a berry. There are 20 species, none of them natives of Britain.

RHAMPHASTOS, in ornithology, a genus belonging to the order of picæ. The bill is large, convex, and ferrated outwards, each mandible is crooked inwards at the point; the nostrils are situate behind the base of the bill; the tongue resembles a feather; and the feet of most of them are fitted for climbing. There are eight species, principally distinguished by their colour.

RHAPSODI, *rhapsodists*, in antiquity, persons who made a business of singing pieces of Homer's poems. Cuper informs us, that the rhapsodi were cloathed in red when they sung the Iliad, and in blue when they sung the Odyssey. They performed on the theatres, and sometimes strove for prizes in contests of poetry, singing, *&c.* But there seems to have been other rhapsodi of more antiquity than those people, who composed heroic poems or songs in praise of heroes and great men, and sung their own compositions from town to town for a livelihood, of which profession Homer himself is said to be.

RHAPSODOMANCY, an ancient kind of divination performed by pitching on a passage of a poet at hazard, and reckoning on it as a prediction of what was to come to pass.

RHAPSODY, in antiquity, a discourse in verse sung or rehearsed by a rhapsodist. Others will have rhapsody to

to signify a collection of verses, especially those of Homer, which having been a long time dispersed in pieces and fragments, were at length, by Pisistratus's order, digested into books called rhapsodies. Hence, among moderns, rhapsody is also used for an assemblage of passages, thoughts, and authorities, raked together from divers authors, to compose some new piece.

RHE, or REE, a little island in the bay of Biscay, near the coast of Aunis in France: W. long. 1° 30′, N. lat. 46° 14′.

RHEIMS, or REIMS, a city of France, capital of the province of Champain, one of the most elegant cities in France, situated seventy-five miles north-east of Paris: E. long. 4°, N. lat. 49° 20′.

RHETERIANS, a sect of heretics in Egypt, so denominated from Rhetorius their leader. The distinguishing doctrine of this heresiarch, as represented by Philastrius, was, that he approved of all the heresies before him, and taught that they were all in the right.

RHETORIC, the art of speaking copiously on any subject, with all the advantage of beauty and force.

Lord Bacon defines rhetoric, very philosophically, to be the art of applying and addressing the dictates of reason to the fancy, and of recommending them there so as to affect the will and desires. The end of rhetoric, the same author observes, is to fill the imagination with ideas and images which may assist nature without oppressing it. Vossius defines rhetoric, The faculty of discovering what every subject affords of use for persuasion. Hence, as every author must invent arguments to make his subject prevail; dispose those arguments, thus found out, in their proper places; and give them the embellishments of language proper to the subject; and, if this discourse be intended to be delivered in public, utter them with that decency and force which may strike the hearer; rhetoric becomes divided into four parts, invention, disposition, elocution, and pronunciation.

Rhetoric and oratory differ from each other as the theory from the practice; the rhetorician being he who describes the rules of eloquence, and the orator he who uses them to advantage. Ordinarily, however, the two are used indifferently for each other. See COMPOSITION

RHEUM, a thin serous humour, occasionally oozing out of the glands about the mouth and throat.

RHEUM in botany. See BOTANY, p. 642.

RHEUMATISM, in medicine. See MEDICINE, p. 124.

RHEXIA, in botany, a genus of the octandria monogynia class. The calix consists of four segments, and the corolla of four petals, inserted into the calix; the antheræ are declined; and the capsule has four cells. There are three species, none of them natives of Britain.

RHINANTHUS, in botany, a genus of the didynamia angiospermia class. The calix is swelled, and has four segments; the capsule is obtuse, compressed, and bilocular. There are six species, only one of which, *viz.* the crista-galli, yellow rattle or cock s-comb, is a native of Britain.

RHINE, a great river rising in the country of the Grisons, in Switzerland, and, running north, continues its course till it forms the lake of Constance; from whence it turns west, and having visited Basil, runs north, dividing Suabia from Alsatia; from thence it runs through the Palatinate, and receiving the Neckar, the Maine, and the Moselle, continues its course north by Mentz, *&c.* After entering the Netherlands at Skenkinchans, it is divided into several channels, the two largest whereof obtain the names of the Lech and the Waal, which running through the United Provinces discharge themselves into the German sea below Rotterdam.

RHINE *lower circle* consists of the Palatinate of the Rhine and the three ecclesiastical electorates, *viz.* those of Cologn, Mentz, and Triers.

RHINE *upper circle* consisted of the Landgraves of Alsatia and Hesse, comprehending the Wetteraw: but only Hesse can be accounted a part of Germany at present, France having united Alsace to that kingdom.

RHINEBURG, a town of Germany, in the circle of the lower Rhine and electorate of Cologn, situated fifteen miles east of Gelder.

RHINEFIELD, the name of two towns of Germany, one whereof is situated in the circle of Suabia, on the Rhine, eight miles east of Basil; the other is the capital of the county of Rhinefield, situated in the circle of the Upper Rhine, sixteen miles north-west of Mentz.

RHINOCEROS, in zoology, a genus of quadrupeds belonging to the order of belluæ, of which there is but one species, *viz.* the unicornis, a native of Africa and India. It has two fore-teeth in each jaw, situate at a great distance from each other, and blunt, and a solid conical horn upon the nose. This, of all quadrupeds, approaches nearest to the elephant in size, the body being nearly as bulky, but the legs much shorter. A full-grown rhinoceros is fourteen feet high; and the legs are so short with all this height, that the belly comes near the ground: the head is very large and oblong, of an irregular figure, broad at top, and depressed towards the snout: the ears resemble those of a hog: the eyes are very small, and situated at a small distance from the extremity of the snout: on the upper part of the snout, near the extremity, stands the horn, growing to about two feet and a half in length, bent a little back, of a black colour, and vastly firm and hard: the skin is remarkably thick and hard, so that the creature could not turn its body in any direction but for the joints and folds in it: the tail is short, and furnished with some long and extremely thick black hairs. The rhinoceros feeds upon thorns and brushwood; like the sow, he wallows in the mire. He is gentle and inoffensive, except when he is injured. But, when irritated, he even overturns large trees in his fury.

RHINOCEROS BIRD. See BUCEROS.

RHIZOPHORO, in botany, a genus of the dodecandria monogynia class. Both calix and corolla consist of four segments; and there is but one long seed, fleshy at the base. The species are seven, none of them natives of Britain.

RHODES, the capital of an island of that name, situated in the Mediterranean sea, in E. long. 28°, and between 36° and 37° N. lat.

RHODIOLA, in botany, a genus of the diœcia enneandria class. The calix of the male consists of four segments, and the corolla of four petals; the calix of the female has four segments; it has no corolla, but four nectaria, and four pistils; and it has four capsules, containing many seeds. There is but one species, *viz.* the rosea, or rose-wort, a native of Britain.

RHODODENDRUM, in botany, a genus of the decandria

dria monogynia clafs. The calix has five fegments; the corolla is fomewhat funnel-fhaped; the ftamina are declined; and the capfule has five cells. There are fix fpecies, none of them natives of Britain.

RHOMBOIDES, in geometry, a quadrilateral figure whofe oppofite fides and angles are equal, but is neither equilateral nor equiangular.

Rhomboides, in anatomy. See Anatomy, p. 193.

RHOMBOIDIA, in natural hiftory, the name of a genus of fpars, given them from their being of a rhomboidal form.

RHOMBUS, in geometry, an oblique-angled parallelogram, or a quadrilateral figure whofe fides are equal and parallel, but the angles unequal, two of the oppofite ones being obtufe, and the other two acute

Rhombus, in ichthyology. See Pleuronectes.

RHONE, one of the largeft rivers in France; which rifing in one of the Alps of Switzerland, paffes through the lake of Geneva, vifits that city, and then runs fouth-weft to Lyons, where joining the river Soane, it continues its courfe due fouth, paffing by Orange, Avignon, and Arles, and falls into the Mediterranean a little weftward of Marfeilles.

RHUBARB. See Botany, p. 642.

RHUMB, Rumb, or Rum, in navigation, a vertical circle of any given place, or the interfection of fuch a circle with the horizon; in which laft fenfe, rhumb is the fame with a point of the compafs. See Navigation.

Rhumb line, is alfo ufed for the line which a fhip defcribes when failing in the fame collateral point of the compafs, or oblique to the meridians. See Navigation.

RHUS, in botany, a genus of the pentandria trigynia clafs. The calix confifts of five fegments, and the corolla of five petals; and the berry contains but one feed. The fpecies are 16, none of them natives of Britain.

RHYME, in poetry, the fimilar found, or cadence and termination of two words which end two verfes, *&c.* Or rhyme is a fimilitude of found between the laft fyllable or fyllables of a verfe, fucceeding either immediately, or at a diftance of two or three lines.

There is no rule in poetry, fays Du Bos, whofe obfervance cofts fo much trouble, and is productive of lefs beauties in verfe, than that of rhyming. Rhyme frequently maims, and almoft always enervates the fenfe of the difcourfe; for one bright thought which the paffion of rhyming throws in our way by chance, is, without doubt, every day the caufe of a hundred others that people would blufh to make ufe of were it not for the richnefs or novelty of the rhyme with which thefe thoughts are attended.

RHYTHM, in mufick, the variety in the movement, as to the quicknefs or flownefs, length or fhortnefs, of the notes. Or it may be defined more generally, the proportion which the parts of the motion have to each other. See Musick.

RIBBAN, or Ribbon, in heraldry, the eighth part of a bend, like that reprefented in Plate CXLVII. fig. 10.

RIBBAND, or Ribbon, a narrow fort of filk, chiefly ufed for head-ornaments, badges of chivalry, *&c.*

RIBES, in botany, a genus of the pentandria monogynia clafs. It has five ftamina, and five petals, both inferted into the calix; the ftylus is bifid, and the berry contains many feeds. There are eight fpecies, three of them natives of Britain, *viz.* the rubrum, or currants; the alpinum, or fweet mountain currants; and the nigrum, or black currants.

RIBS, in anatomy. See Anatomy, p. 173.

RICCIA, in botany, a genus of the cryptogamia algæ clafs. There are four fpecies, all natives of Britain.

RICE, in botany. See Oryza.

RICHARDIA, in botany, a genus of the hexandria monogynia clafs. The calix has fix fegments, and the corolla one fubcylindrical petal; and the feeds are three. There is but one fpecies, a native of Vera Crux.

RICHLIEU, a town of France, in the province of Orleanois and territory of Poictou, fituated twenty-fix miles north of Poictiers.

RICHMOND, a village in the county of Surry, ten miles weft of London, formerly the refidence of the kings of England.

Richmond is alfo a borough town of Yorkfhire, thirty-three miles north-weft of York. It fends two members to parliament.

RICINUS, in botany, a genus of the monœcia monadelphia clafs. The calix of the male has five fegments; it has no corolla, but the ftamina are numerous: The calix of the female has three fegments; it has no corolla; the ftyli are three, and bifid; and the capfule has three cells, and one feed. There are three fpecies, none of them natives of Britain.

RICKETS, in medicine. See Medicine, p. 169.

RIDGE, in agriculture, a long piece of rifing land, between two furrows. See Agriculture, p. 57.

RIDGLING, or Ridgel, among farriers, *&c.* the male of any beaft that has been but half gelt.

RIDICULE, in matters of literature, is that fpecies of writing, which excites contempt with laughter.

RIDING, a divifion of Yorkfhire; of which there are three, *viz.* the eaft, weft, and north ridings.

In all indictments in that county, both the town and riding muft be expreffed.

RIEF, in Scots law. See Robbery.

RIGA, a port-town of Livonia, one of the beft harbours and trading towns in the Baltic: E. long. 24°, N. lat. 57°.

RIGGING *of a fhip*, is all her cordage and ropes, belonging to her mafts, yards, *&c.*

RIGHT, in geometry, fignifies the fame with ftraight: thus, a ftraight line is called a right one.

RIGIDITY, in phyfics, denotes a brittle hardnefs. It is oppofed to ductility, malleability, and foftnefs.

RIGOR, in medicine, a convulfive fhuddering, from fevere cold, an ague-fit, or other diforder.

RIMINI, a port-town of Italy, in the territories of the pope, and province of Romania, fituated on the gulph of Venice: E. long. 13° 30', and N. lat. 44° 8'.

RIND, the fkin of any fruit that may be cut off or pared.

Rind is alfo ufed for the inner bark of trees, or that whitifh foft fubftance which adheres immediately to the wood.

RING, an ornament of gold, filver, *&c.* made of a circular form, and generally worn on the finger.

Ring-bone, in farriery, a hard callous fubftance, growing in the paftern of a horfe, above the coronet: it is thus called from its growing quite round like a ring. See Farriery.

RIO GRANDE, a river of Terra Firma, which rising almost under the equator, and running north, falls into the north sea between Carthagena and St Martha.

RIO GRANDE is also a river of Africa, which runs from east to west through Negroland, and falls into the Atlantic ocean, in 11° N. lat.

RIO JANEIRO, a river of South America, which rises in the mountains west of Brazil, and falls into the Atlantic ocean almost under the tropic of capricorn.

RIOT, in law, is where three or more persons, assembled together, commit some unlawful act, with force and violence, to the disturbance of the peace; as beating some person, forcibly entering upon the possession of the lands, houses, *&c.* of another, or breaking down inclosures, houses, *&c.*

By stat. 1. Geo. I. cap. v. if any persons to the number of twelve or more, unlawfully and riotously assembled, continue together for an hour, after being required, by a justice of the peace, or other magistrate, to disperse, they shall be deemed guilty of felony without benefit of clergy. However, prosecutions upon this statute, must be begun within one year after the offence is committed.

RIPPON, a borough-town of Yorkshire, twenty one miles north-west of York. It sends two members to parliament.

RISK, in gaming, *&c.* See CHANCE.

RITE, among divines, denotes the particular manner of celebrating divine service, in this or that country.

RITORNELLO, or REPEAT, in musick, the burden of a song, or the repetition of the first or other verses of a song at the end of each stanza or couplet.

RITUAL, a book directing the order and manner to be observed in celebrating religious ceremonies, and performing divine service in a particular church, diocese, order, or the like.

RIVAL, a term applied to two or more persons, who have the same pretensions, and which is properly applied to a competitor in love, and figuratively to an antagonist in any other pursuit.

RIVER a current or stream of fresh water flowing in a bed or channel from its source into the sea.

The great as well as the middle-sized rivers proceed either from a confluence of brooks and rivulets, or from lakes; but no river of considerable magnitude flows from one spring, or one lake, but is augmented by the accession of others. Thus the Wolga receives above two hundred rivers and brooks before it discharges itself into the Caspian Sea; and the Danube receives no less, before it enters the Euxine Sea.

RIVINIA, or RIVINA, in botany, a genus of the tetrandria monogynia class. The corolla consists of four permanent petals; it has no calix; and the berry contains one rough seed. There are two species, none of them natives of Britain.

RIVULET, a diminutive of river. See RIVER.

ROACH, in ichthyology. See CYPRINUS.

ROANOAK, an island in North America, near the coast of Albermarle-county, in North Carolina: W. long. 75°, N. lat. 35° 40′.

ROB, in pharmacy, the juices of fruits purified and inspissated till it is of the consistence of honey.

Rob of alder-berries is thus prepared: Take two quarts of the juice of ripe alder-berries, and half a pound of refined sugar. Evaporate over a gentle fire, or in a water bath, till it is of a due consistence.

ROBBERY, in law, a felonious taking away anothers man's goods, from his person, presence, or estate, by putting him in fear. See LAW, Tit. xxxiii. 30.

ROBINIA, in botany, a genus of the diadelphia decandria class. The vexillum is open, reflected, and roundish; the calix has four teeth, the uppermost being emarginated. There are six species, none of them natives of Britain.

ROBORANTS, in pharmacy, medicines which strengthen the parts, and give new vigour to the constitution.

ROCHEFOUCAUT, a town of Orleanois, in France, fifteen miles east of Angoulesme.

ROCHELLE, a city and port-town of Orleanois, in France: W. long. 1° 5′, N. lat. 46° 7′.

ROCHESTER, a city of Kent, situated on the river Medway, thirty miles east of London, and twenty-two west of Canterbury.

ROCHFORD, a market-town of Essex, thirty-three miles east of London, and fifteen south-east of Chelmsford.

ROCHFORT, a port-town of Guienne, in France, twenty-three miles south of Rochelle: W. long. 1°, N. lat. 46°. It is one of the stations of the French navy, having a commodious harbour, well secured by forts and batteries.

ROCK, a large mass or block of hard stone rooted in the ground.

ROCK-*crystal*, otherwise called sprig-crystal, in natural history, a name given to the third order of crystals, from their being affixed to a rock or other solid body.

This kind of crystal is the most common of all others, and is what the generality of authors describe under the name of crystal of the shops, being that kept for medicinal purposes.

The clearest, purest, and most transparent that can be had, ought to be chosen; and to prove its genuineness, it may be tried with aqua fortis, true crystal making no effervescence with that menstruum.

ROCKET, an artificial fire-work, consisting of a cylindrical case of paper, filled with a composition of certain combustible ingredients; which, being tied to a stick, mounts into the air, to a considerable height, and there bursts.

ROCKINGHAM, a market-town of Northamptonshire, situated nineteen miles north of Northampton.

ROD, a land measure of sixteen feet and a half: the same with perch and pole.

Black ROD, a staff carried by the king's gentleman-usher, as a badge of his office; this rod or staff is black, and has a lion in gold on its top. See USHER.

Fishing ROD, a long taper rod or wand, to which the line is fastened for angling.

ROE, the spawn or seed of fish. That of the male fishes is usually distinguished by the name of soft roe, or milt; and that of the female, by hard roe, or spawn.

So inconceivably numerous are these ovula, or small eggs, that M. Petit found 342144 of them in a carp of eighteen inches: but M. Leewenhoeck found in a carp no more than 211629. This last gentleman observes, that there are four times this number in a cod, and that a common one contains 9344000 eggs.

ROE, in zoology. See CERVUS.

ROELLA,

ROELLA, in botany, a genus of the pentandria monogynia clafs. The corolla is funnel-fhaped; the ftigma is bifid; and the capfule is cylindrical, and has two cells. The fpecies are two, none of them natives of Britain.

ROER, the name of two rivers in Germany, one of which rifes on the confines of Heffe, and falls into the Rhine, a little below Duyfburg; the other rifes in the duchy of Juliers, and falls into the Maefe at Roermond.

ROGA, in antiquity, a prefent which the emperors made to the fenators, magiftrates and even to the people; and the popes or patriarchs to their clergy.

These rogæ were diftributed by the emperors on the firft day of the year, on their birth day, or on the natalis dies of the cities; and by the popes and patriarchs, in paffion-week.

Roga is alfo ufed for the common pay of the foldiers.

ROGATION, in the Roman jurifprudence, a demand made by the confuls or tribunes of the Roman people, when a law was propofed to be paffed. Rogatio is alfo ufed for the decree itfelf made in confequence of the peoples giving their affent to this demand, to diftinguifh it from a fenatus-confultum, or decree of the fenate.

ROGATION WEEK, the week immediately preceding Whitfunday, fo called from the three fafts therein, on Monday, Tuefday, and Wednefday, which are alfo called rogations, or rogation days, from the extraordinary prayers and fupplications at this time offered to God by devout Chriftians to appeafe his anger and deprecate his judgments.

ROGUE, in law, an idle fturdy beggar; who by ancient ftatutes is for the firft offence called a rogue of the firft degree, and punifhed by whipping, and boring through the griftle of the right ear with a hot iron; and for the fecond offence, is termed a rogue of the fecond degree, and, if above eighteen years of age, ordered to be executed as a felon.

ROHAN, a town of France, in the province of Britany, fituated twenty miles north of Vannes.

ROLL, in manufactories, fomething wound and folded up in a cylindrical form.

ROLL, in law, fignifies a fchedule or parchment which may be rolled up by the hand into the form of a pipe.

Mufter-ROLL, that in which are entered the foldiers of every troop, company, regiment, *&c.*

ROLLS-OFFICE, is an office in Chancery-lane, London, appointed for the cuftody of the rolls and records in chancery.

ROLLS *of parliament*, are the manufcript regifters, or rolls of the proceedings of our ancient parliaments, which, before the invention of printing, were all engroffed on parchment, and proclaimed openly in every county. In thefe rolls are alfo contained a great many decifions of difficult points of law, which were frequently in former times referred to the decifion of that high court.

ROLL, or ROLLER, is alfo a piece of wood, iron, brafs, *&c.* of a cylindrical form, ufed in the conftruction of feveral machines, and in feveral works and manufactures.

ROMAN, in general, fomething belonging to the city of Rome. See ROME.

King of the ROMANS, in modern hiftory, is a prince elected to be fucceffor to the reigning emperor of Germany.

ROMANCE, in matters of literature, a fabulous relation of certain adventures defigned for the entertainment and inftruction of the readers.

The true nature and genuine characteriftics of this fpecies of writing are excellently explained by the ingenious author of the Rambler; who obferves, that the works of fiction, with which the prefent generation feems more particularly delighted, are fuch as exhibit life in its true ftate, diverfified only by the accidents that daily happen in the world, and influenced by thofe paffions and qualities which are really to be found in converfing with mankind.

ROMANIA, a province of the pope's territories in Italy, including the Bolognefe and Ferrarefe. See BOLOGNA and FERRARA.

ROMANIA, is alfo the modern name of ancient Thrace, which now makes a province of Turky in Europe; lying weftward of the Propontis, between the Euxine fea and the Archipelago.

ROME, the capital of the pope's territories and of Italy, and anciently the miftrefs of the Roman Empire: E. lon. 13°, N. lat. 41° 45′.

Rome is ftill a large and fine city, though not to be compared to ancient Rome; the ftreets are fpacious, and magnificently built; it has five bridges over the Tiber, twenty gates, three hundred churches, and a vaft number of palaces, convents, triumphal arches, pillars, obelifks, ftatues, theatres, *&c.*

ROMNEY, a borough town of Kent, and one of the cinque ports, fituated twelve miles fouth-weft of Dover. It fends two members to parliament

ROMPEE, or ROMPU, in heraldry, is applied to ordinaries that are reprefented as broken, and to chevrons, bends, or the like, whofe upper points are cut off. See Plate CXLVII. fig. 11.

RONDELETIA, in botany, a genus of the pentandria monogynia clafs. The corolla is funnel fhaped; and the capfule has two cells, containing many round coronated feeds. There are two fpecies, none of them natives of Britain.

ROOD, a quantity of land equal to forty fquare perches, or the fourth part of an acre.

ROOF, in architecture, the uppermoft part of a building. See ARCHITECTURE, p. 361.

ROOK, in ornithology. See CORVUS.

ROOM, a chamber, parlour, or other apartment, in a houfe. See ARCHITECTURE, p. 359.

ROOT, among botanifts, denotes that part of a plant which imbibes the nutritious juices of the earth, and tranfmits them to the other parts. See AGRICULTURE, p. 42.

ROOT, in algebra and arithmetick. See ALGEBRA, p. 84. *&c.* and ARITHMETICK, p. 420.

ROPE, hemp, hair, *&c.* fpun out into a thick yarn, and then feveral ftrings of this yarn twifted together by means of a wheel. When made very fmall, it is called a cord; and when very thick, a cable.

ROPE YARN, among failors, is the yarn of any rope untwifted, but commonly made up of junk; its ufe is to make finnet, mats, *&c.*

ROSA, in botany, a genus of the icofandria polygamia clafs. The petals are five; the calix has five flefhy fegments; and the feeds are numerous, rough, and inferted into the interior fide of the calix. There are 14 fpecies, five of them natives of Britain, *viz.* the eglanteria, or fweet briar; the fpinofiffima, or burnet rofe; the arvenfis, or white-flowered dogs-rofe; the villofa, or apple-rofe; and the canina, or red-flowered dogs-rofe, or hip-tree.

ROSA-

ROSACEOUS, among botaniſts, an appellation given to ſuch flowers as are compoſed of ſeveral petals or leaves, diſpoſed in a ſort of circular form, like thoſe of the roſe.

ROSARY, among the Roman-catholics. See CHAPLET.

ROSCOMMON, a county of Ireland, bounded by Letrim on the north, and Galway on the ſouth.

ROSE, in botany. See ROSA.

ROSE NOBLE, an ancient Engliſh gold-coin, firſt ſtruck in the reign of Edward III. It was formerly current at 6 s 8 d. and ſo called becauſe ſtamped with a roſe.

ROSMARINUS, in botany, a genus of the diandria monogynia claſs. The corolla is unequal, and the upper lip of it is ſplit into two ſegments; the filaments are long, crooked, and ſimple. There is but one ſpecies, *viz.* the officinalis, a native of Spain.

Roſemary is a very valuable cephalic, and is good in all diſorders of the nerves, and in hyſteric and hypochondriac diſeaſes. It is good in palſies, apoplexies, epilepſies, and vertigoes.

ROSIENNE, a town of Samogitia, in Poland: E. long. 23° 30′, N. lat. 55° 50′.

ROSIN. See RESIN.

ROSS, a county of Scotland, bounded by Sutherland on the north, by the German ſea and the Murray frith on the eaſt and ſouth, and by Inverneſs-ſhire and the weſtern ocean on the ſouth and weſt.

ROSS is alſo a market-town, ſituated on the river Wye, eleven miles ſouth of Hereford.

ROSSE, a port-town of Ireland, twenty-two miles weſt of Kinſale.

ROS-SOLIS, SUN-DEW, an agreeable ſpirituous liquor, compoſed of burnt brandy, ſugar, cinnamon, and milk-water; and ſometimes perfumed with a little muſk: it is ſo called, as being at firſt prepared wholly of the juice of the plant ros-ſolis, or droſera. See DROSERA.

ROSTOCK, an imperial city of Lower Saxony, ſituated on a bay of the Baltic ſea: E. long. 12° 15′, and N. lat. 54° 20′.

ROSTOF, or ROSTOVA, the capital of a territory of the ſame name, in Ruſſia: E. lon. 40°, and N. lat. 57° 20′.

ROSTRA, in antiquity, a part of the Roman forum, wherein orations, pleadings, funeral harangues, *&c.* were delivered.

ROSTRUM, literally denotes the beak or bill of a bird; and hence it has been figuratively applied to the beak, or head of a ſhip.

ROSYCRUCIANS, ROSICRUCIANS, or *brothers of the roſy croſs*, a name aſſumed by a ſect or cabal of hermetical philoſophers, who appeared, or at leaſt were firſt taken notice of, in Germany, in the beginning of the XVIth century. They pretended to be maſters of all ſciences, and to have many important ſecrets, particularly that of the philoſophers ſtone.

Their ſociety is frequently denoted by the abbreviatures F.R.C.

ROT, a diſeaſe incident to ſheep, ariſing from wet ſeaſons, and too moiſt paſture. It is a very hard thing to prevent the rot, if the year prove very wet, eſpecially in May and June. Salt-marſhes, and lands where broom grows, are the beſt places of preſervation for them. Sheep are ſometimes all cleared of the rot, when not too far gone with it, only by removing them into broom-fields. Scurvy-graſs, muſtard, parſley, and thyme, are alſo good for the prevention of it.

ROTA, the name of an eccleſiaſtical court at Rome, compoſed of twelve prelates, whereof one muſt be a German, another a Frenchman, and two Spaniards; the other eight are Italians, three of whom muſt be Romans, and the other five a Bologneſe, a Ferraran, a Milaneſe, a Venetian, and a Tuſcan.

This is one of the moſt auguſt tribunals in Rome, which takes cognizance of all ſuits in the territory of the church, by appeal; as alſo of all matters beneficiary and patrimonial.

ROTATION, in geometry, a term chiefly applied to the circumvolution of any ſurface round a fixed and immoveable line, which is called the axis of its rotation: and by ſuch rotations it is, that ſolids are conceived to be generated.

ROTHERAM, a market-town of Yorkſhire, 35 miles ſouth-weſt of York.

ROTHSAY, a parliament-town of Scotland, in the iſle of Bute: W. long. 5°, and N. lat. 55° 50′.

ROTONDO, or ROTUNDO, in architecture, an appellation given to any building that is round both within and without ſide, whether it be a church, a ſalon, or the like. The moſt celebrated rotondo of the ancients, is the pantheon at Rome.

ROTTENNESS. See PUTREFACTION.

ROTTERDAM, a city of the province of Holland, ſituated on the north bank of the Maeſe, thirty miles ſouth of Amſterdam, and thirteen miles ſouth-eaſt of the Hague: E. long. 4° 20′, and N. lat. 52°.

ROTULA, in anatomy, See ANATOMY, p. 185.

ROTUNDUS, in anatomy, a name given to ſeveral muſcles, otherwiſe called teres.

ROUEN, a city of France, and capital of Normandy, ſituated on the north ſide of the Seyne, ſixty-five miles north of Paris, and forty-five miles ſouth-eaſt of Havre de Grace and the Britiſh channel: E. long. 1° 6′, N. lat. 49° 30′.

ROVIGO, the capital of the Poleſin de Rovigo, in Italy, ſubject to Venice: E. long. 12° 25′, N. lat 45° 6′.

ROUND-HOUSE, a kind of priſon, for the nightly watch in London to ſecure diſorderly perſons, till they can be carried before a magiſtrate.

ROUND-HOUSE, in a ſhip, the uppermoſt room, or cabbin, on the ſtern of a ſhip, where the maſter lies.

ROUNDELAY, a kind of ancient poem thus termed, according to Menage, from its form, becauſe it turns back again to the firſt verſe, and thus goes round. This poem is little known among us, but is very common among the French, who call it rondeau. It conſiſts commonly of thirteen verſes, eight whereof are in one rhime, and five in another. It is divided into couplets, at the end of the ſecond and third whereof the beginning of the roundelay is repeated, and that if poſſible in an equivocal or pauſing ſenſe.

ROUSILLON, formerly a province of Spain, now united to France, is bounded by Languedoc on the north, by the Mediterranean ſea on the eaſt, by Catalonia on the ſouth, and by the Pyrenean mountains on the weſt, being about fifty-five miles long, and thirty-ſix broad.

ROUTE, a public road, highway, or courfe, efpecially that which military forces take. This word is alfo ufed for the defeat and flight of an army.

Rout, in law, is applied to an affembly of perfons, going forcibly to commit fome unlawful act, whether they execute it or not.

ROWEL, among farriers, a kind of iffue, made by drawing a fkain of filk, thread, hair, or the like, through the nape of the neck, or other part of a horfe; anfwering to what in furgery is called a feton. See Farriery.

ROXBURGH, the name of a county in Scotland, which fends one member to parliament.

ROXENT cape, or Rock *of Lifbon*, a mountain and remarkable promontory in Portugal, fituated in the Atlantic ocean, at the north entrance of the river Tagus, twenty-two miles north of Lifbon.

ROYAL, fomething belonging to a king: thus we fay, royal family, royal affent, royal exchange, *&c.*

Royal-*oak*, a fair fpreading tree at Bofcobel, in the parifh of Donnington in Staffordfhire, the boughs whereof were once covered with ivy; in the thick of which king Charles II. fat in the day time with colonel Carelefs, and in the night lodged in Bofcobel houfe: fo that they are miftaken who fpeak of it as an old hollow oak, it being then a gay flourifhing tree, furrounded with many more. The poor remains thereof are now fenced in with a handfome wall, with this infcription over the gate in gold-letters: *Fælicifſimam arborem quam in afylum potentiffimi regis* Caroli II. *Deus op. max. per quem reges regnant, hic crefcere voluit*, &c.

Royal-*fociety*. See Society.

ROYALTIES, the rights of the king, otherwife called the king's prerogative, and the regalia. See Prerogative, and Regalia.

ROYENA, in botany, a genus of the decandria digynia clafs. The calix is urceolated; the corolla confifts of one petal, bent back at the edge; the capfule has one cell, and four valves. There are three fpecies, all natives of the Cape of Good Hope.

ROYSTON, a market-town, fituated in the counties of Hertford and Cambridge, thirty-eight miles north of London.

RUBELLIO, in ichthyology. See Cyprinus.

RUBETA, in zoology. See Rana.

RUBIA, in botany, a genus of the tetrandria monogynia clafs. The corolla confifts of one bell-fhaped petal; and the berry contains one feed. There are two fpecies, none of them natives of Britain.

RUBIGALIA, in antiquity, a feaft celebrated by the Romans, in honour of the god Rubigus, or the goddefs Rubigo, to engage thefe deities to preferve the corn from blights and mildews.

RUBIGO, a difeafe incident to corn, commonly called Mildew, being a fpecies of blight. See Blight.

RUBININSKA, one of the northern provinces of Ruffia, bounded by the province of Dwina on the north, by Syrianes on the eaft, by Belozero on the fouth, and by the lake of Onega on the weft.

RUBRIC, in the canon-law, fignifies a title or article in certain ancient law-books; thus called becaufe written, as the titles of the chapters in our ancient Bibles are, in red letters.

RUBUS, in botany, a genus of the icofandria polygynia clafs. The calix confifts of five fegments, and the corolla of five petals; and the berry has many feeds. There are 13 fpecies, five of them natives of Britain, *viz.* the idæus, or rafpberry-bufh, the cæfius, or fmall bramble; the fruticofus, or common bramble; the faxatilis, or ftone-bramble; and the chamæmorus, or cloud-berries.

RUBY, in natural hiftory, a fpecies of gems, being a beautiful gem of a red colour with an admixture of purple.

This, in its moft perfect and beft coloured ftate, is a gem of prodigious beauty and extreme value; it is often found perfectly pure and free from blemifhes or foulnefs, but much more frequently debafed greatly in its value by them, efpecially in the larger fpecimens. It is of very great hardnefs, equal to that of the fapphire, and fecond only to the diamond. It is various in fize, but lefs fubject to variations in its fhape than moft of the other gems. It is ufually found very fmall, its moft common fize being equal to that of the head of the largeft fort of pins; but it is found of four, eight, or ten caracts, and fometimes, though very rare, up to twenty, thirty, or forty. It is never found of an angular or cryftalliform fhape, but always of a pebble-like figure, often roundifh, fometimes oblong and much larger at one end than at the other, and in fome form refembling a pear, and is ufually flatted on one fide. It commonly is naturally fo bright and pure on the furface, as to need no polifhing; and when its figure will admit of being fet without cutting, it is often worn in its rough ftate, and with no other than its native polifh.

We have the true ruby only from the Eaft Indies; and the principal mines of it are in the kingdom of Pegu and the ifland of Ceylon.

Ruby, in heraldry, denotes the red colour wherewith the arms of noblemen are blazoned; being the fame which, in the arms of thofe not noble, is called, gules. See Gules.

RUCTATION, a ventofity arifing from indigeftion, and difcharging itfelf at the mouth with a very difagreeable noife.

RUDBECKIA, in botany, a genus of the fyngenefia polygamia fruftranea clafs. The receptacle is conical and paleaceous: the pappus has four teeth on its edge; and the calix confifts of a double row of fcales. There are fix fpecies, none of them natives of Britain.

RUDDER, in navigation, a piece of timber turning on hinges in the ftern of the fhip, and which, oppofing fometimes one fide in the water and fometimes another, turns or directs the veffel this way or that. See Ship.

RUDENTURE, in architecture, the figure of a rope or ftaff, fometimes plain, fometimes carved, with which the third part of flutings of columns are frequently filled up.

RUDIARUS, in antiquity, a veteran gladiator who had got a difcharge from the fervice.

RUDIMENTS, the firft principles or grounds of any art or fcience, called alfo the elements thereof.

RUE, in botany. See Ruta.

RUELLIA, in botany, a genus of the didynamia angiofpermia clafs. The calix has five fegments, and the corolla is fubcampanulated; and the ftamina are very near each other. There are eleven fpecies, none of them natives of Britain.

RUFF, in ichthyology. See Perca.

Ruff, in ichthyology. See Tringa.

RUGEN,

RUGEN, an island of the Baltic sea, on the coast of Germany, being part of the duchy of Swedish Pomerania, separated from the continent by a narrow channel: this island is thirty miles long, and near as many broad.

RUINS, a term particularly used for magnificent buildings fallen into decay by length of time, and whereof there only remains a confused heap of materials.

RULE, in matters of literature, a maxim, canon, or precept, to be observed in any art or science.

RULE OF THREE. See ARITHMETICK, p. 331.

RULE, or RULER, an instrument of wood or metal, with several lines delineated on it, of great use in practical mensuration. When a ruler has the lines of chords, tangents, sines, *&c.* it is called a plane scale.

RUM, a species of brandy or vinous spirits, distilled from sugar-canes.

Rum, according to Dr. Shaw, differs from simple sugar-spirit, in that it contains more of the natural flavour or essential oil of the sugar-cane; a great deal of raw juice and parts of the cane itself being often fermented in the liquor or solution of which the rum is prepared. The unctuous or oily flavour of rum is often supposed to proceed from the large quantity of fat used in boiling the sugar; which fat, indeed, if coarse, will usually give a stinking flavour to the spirit, in our distillations of the sugar liquor, or wash, from our refining sugar-houses; but this is nothing of kin to the flavour of the rum, which is really the effect of the natural flavour of the cane.

The method of making rum is this: When a sufficient stock of the materials is got together, they add water to them, and ferment them in the common method, though the fermentation is always carried on very slowly at first; because at the beginning of the season for making rum in the islands, they want yeast, or some other ferment to make it work; but by degrees, after this, they procure a sufficient quantity of the ferment, which rises up as a head to the liquor in the operation; and thus they are able afterwards to ferment and make their rum with a great deal of expedition, and in large quantities

When the wash is fully fermented, or to a due degree of acidity, the distillation is carried on in the common way, and the spirit is made up proof: though sometimes it is reduced to a much greater strength, nearly approaching to that of alcohol or spirit of wine, and it is then called double-distilled rum. It might be easy to rectify the spirit, and bring it to much greater purity than we usually find it to be of: for it brings over in the distillation a very large quantity of the oil; and this is often so disagreeable, that the rum must be suffered to lie by a long time to mellow before it can be used; whereas, if well rectified, it would grow mellow much sooner, and would have a much less potent flavour.

The best state to keep rum in, both for exportation and other uses, is doubtless that of alcohol, or rectified spirit. In this manner it would be transported in one half the bulk it usually is, and might be let down to the common proof-strength with water when necessary: for the common use of making punch, it would likewise serve much better in the state of alcohol; as the taste would be cleaner; and the strength might always be regulated to a much greater exactness than in the ordinary way.

The only use to which it would not so well serve in this state, would be the common practice of adulteration among our distillers; for when they want to mix a large portion of cheaper spirit with the rum, their business is to have it of the proof-strength, and as full of the flavouring oil as they can, that it may drown the flavour of the spirits they mix with it, and extend its own. If the business of rectifying rum was more nicely managed, it seems a very practicable scheme to throw out so much of the oil, as to have it in the fine light state of a clear spirit, but lightly impregnated with it; in this case it would very nearly resemble arrac, as is proved by the mixing a very small quantity of it with a tasteless spirit, in which case the whole bears a very near resemblance to arrac in flavour.

Rum is usually very much adulterated in England; some are so bare-faced as to do it with malt-spirit; but when it is done with molasses-spirit, the tastes of both are so nearly allied, that it is not easily discovered. The best method of judging of it is, by setting fire to a little of it; and when it has burnt away all the inflammable part, examining the phlegm both by the taste and smell.

RUMELIA, in geography, the same with ancient Greece, now a part of Turky in Europe.

RUMEN, the paunch, or first stomach of such animals as chew the cud, thence called ruminant animals.

The rumen is by far the largest of all the stomachs, and in it the whole mass of crude aliments, both solid and liquid, lies and macerates, to be thence transmitted to the mouth to be again chewed, comminuted, and fitted for farther digestion in the other ventricles.

RUMEX, in botany, a genus of the hexandria trigynia class. The calix has three leaves, and the corolla three connivent petals; and there is but one triangular seed. The species are 27, of which ten are natives of Britain.

RUMFORD, a market-town of Essex, ten miles east of London.

RUNGS, in a ship, the same with the floor or ground timbers, being the timbers which constitute her floor, and are bolted to the keel, whose ends are rung-heads.

RUNG-*heads*, in a ship, are made a little bending, to direct the sweep or mold of the futtocks and navel timbers: for here the lines, which make the compass and bearing of a ship, do begin.

RUNIC, a term applied to the language and letters of the ancient Goths, Danes, and other northern nations.

RUNNER, in the sea-language, a rope belonging to the garnet, and to the two bolt-tackles. It is reeved in a single block, joined to the end of a pennant, and has at one end a hook to hitch into any thing, and at the other end a double block, into which is reeved the fall of the tackle, or the garnet, by which means it purchases more than the tackle would without it.

RUNNET, or RENNET, the acid juice found in the stomachs of calves that have fed on nothing but milk, and are killed before the digestion is perfect. It curdles milk.

RUPERT's DROPS, a sort of glass-drops with long and slender tails, which burst to pieces on the breaking off those tails in any part, said to have been invented by prince Rupert, and therefore called after his name. This surprising phænomenon is supposed to rise from hence, that while the glass is in fusion, or in a melted state, the particles of it are in a state of repulsion; but being dropped into cold water, it so condenses the particles in the external parts of their superficies, that they are easily reduced

duced within the power of each other's attraction, and by that means they form a ſort of hard caſe, which keeps confined the beforementioned particles in their repulſive ſtate; but when this outer-caſe is broke, by breaking off the tail of the drop, the ſaid confined particles have then a liberty to exert their force, which they do by burſting the body of the drop, and reducing it to a very peculiar form of powder.

RUPERT-FORT, a ſettlement belonging to the Hudſon's Bay company, ſituated at the bottom of the ſaid bay, in W. long. 80°, N. lat. 51°.

RUPICAPRA, in zoology. See CAPRA.

RUPPIA, in botany, a genus of the tetrandria tetragynia claſs. It has neither calix nor corolla; but four pedicled ſeeds. There is one ſpecies, *viz*. the marina, or ſea-graſs.

RUPTURE, in ſurgery. See SURGERY.

RURAL, or RUSTIC, in general, denotes ſomething that relates to the country.

RUSCUS, BUTCHER'S-BROOM, in botany, a plant of the diœcia ſyngeneſia claſs. The calix of the male conſiſts of ſix leaves; it has no corolla; the nectarium is central, oval, and perforated at the top: The calix, corolla, and nectarium of the female are the ſame with thoſe of the male; it has one ſtylus; and the berry has three cells, and two ſeeds. There are five ſpecies, only one of them, *viz*. the aculeatus, knee-holly, or butcher's-broom, a native of Britain.

RUSH, in botany. See JUNCUS.

RUSSIA, or MUSCOVY, a large empire, comprehending a vaſt extent of country, in the moſt northerly parts of Europe and Aſia, from 24° to 130°, E long. and between 45° and 72° N. lat.

Its capital cities are Moſcow and Peterſburg.

RUST *of a metal*, the flower or calx thereof, procured by corroding and diſſolving its ſuperficial parts by ſome menſtruum. Water is the great inſtrument or agent in producing ruſt: and hence oils, and other fatty bodies, ſecure metals from ruſt; water being no menſtruum to oil, *&c.* and therefore not able to make its way through it.

All metals are liable to ruſt, even gold itſelf, if expoſed to the fumes of ſea-ſalt.

RUSTIC, in architecture, implies a manner of building in imitation of nature, rather than according to the rules of art. See ARCHITECTURE.

RUSTIC WORK, is where the ſtones in the face, *&c.* of a building, inſtead of being ſmooth, are hatched, or picked with the point of a hammer.

RUSTRE, in heraldry, a bearing of a diamond-ſhape, pierced through in the middle with a round hole. See Plate CXLVII. fig. 12.

RUT, in hunting, the venery or copulation of deer.

RUTA, in botany, a genus of the decandria monogynia claſs. The calix has five ſegments; the petals are concave; the germen is ſurrounded by ten melliferous pores; and the capſule is lobbed. There are three ſpecies, none of them natives of Britain.

The dried herb is much uſed in medicine, by way of infuſion; being eſteemed an excellent alexipharmic and cephalic, and accordingly preſcribed in the ſmall-pox, meaſles, and hyſteric and nervous caſes; as alſo in peripneumonies and pleuriſies, to ſtrengthen the ſtomach, and to prevent the return of habitual colics.

Goat RUE, in botany. See GALEGA.

Meadow RUE. See THALICTRUM.

Wall RUE. See ADIANTUM.

Book of RUTH, a canonical book of the Old Teſtament, being a kind of appendix to the book of Judges, and an introduction to thoſe of Samuel; and having its title from the perſon whoſe ſtory is here principally related. In this ſtory are obſervable the ancient rights of kindred and redemption, and the manner of buying the inheritance of the deceaſed, with other particulars of great note and antiquity.

RUTHYN, a market-town of Denbighſhire, eight miles ſouth-eaſt of Denbigh.

RUTICILLA, in ornithology. See MUSCUAPA.

RUTILUS, in ichthyology. See CYPRINUS.

RUTLAND, the leaſt county in England, bounded by Lincolnſhire on the north-eaſt, by Northamptonſhire on the ſouth-eaſt, and by Leiceſterſhire on the weſt and north-weſt.

RYE, in botany. See SECALE.

RYE, in geography, a borough and port town of Suſſex, ſituated on a bay of the Engliſh Channel, ſixty miles ſouth-eaſt of London. It ſends two members to parliament.

RYNCHOPS, in ornithology, a genus belonging to the order of anſeres. The beak is ſtrait, the ſuperior mandible being much ſhorter than the inferior, which is truncated at the point. The ſpecies are two, *viz*. the nigra and fulva, both natives of America.

RYPEN, a city and port-town of Jutland, in Denmark: E. long. 9° N. lat. 55° 30′.

RYSWICK, a fine village in Holland, between the Hague and Delft, where the peace in 1697 was concluded.

RZCEZICA, a city of Lithuania, in Poland, ſituated on the river Nieper, E. long. 30°, N. lat. 53°.

S.

SABA, one of the Caribbee iſlands, ſubject to the Dutch: W. long. 63°, N. lat. 18°.

SABÆANS, in church-hiſtory, a ſect of idolaters, much ancienter than the Jewiſh law.

In the early ages of the world, idolatry was divided between two ſects; the worſhippers of images, called Sabæans, or Sabians; and the worſhippers of fire, called magi. See MAGI.

The

The Sabæans began with worſhipping the heavenly bodies, which they fancied were animated by inferior deities. In the conſecratton of their images, they uſed many incantations to draw down into them from the ſtars thoſe intelligences for whom they erected them, whoſe power and influence they held afterwards dwelt in them. This religion, it is ſaid, firſt began among the Chaldæans, with their knowledge in aſtronomy: and from this it was, that Abraham ſeparated himſelf, when he came out of Chaldæa. From the Chaldæans it ſpread all over the eaſt; and from thence to the Grecians, who propagated it to all the nations of the known world. The remainder of this ſect ſtill ſubſiſts in the eaſt, and pretend to derive their name from Sabius a ſon of Seth; and among the books in which the doctrines of this ſect are contained, they have one which they call the book of Seth, and which they pretend was written by that patriarch.

SABBATH, or the day of reſt, a ſolemn feſtival of the Jews, on the ſeventh day of the week, or Saturday, beginning from ſun-ſet on Friday, to ſun-ſet on Saturday.

The obſervation of the Sabbath began with the world: for God having employed ſix days in its creation, appointed the ſeventh as a day of reſt to be obſerved by man, in commemoration of that great event. On this day the Jews were commanded to abſtain from all labour, and to give reſt to their cattle. They were not allowed to go out of the city farther than two thouſand cubits, or a mile; a cuſtom which was founded on the diſtance of the ark from the tents of the Iſraelites, in the wilderneſs, after their leaving Egypt; for being permitted to go, even on the ſabbath day, to the tabernacle to pray, they from thence inferred, that the taking a journey of no greater length, tho' on a different account, could not be a breach of the ſabbatical reſt.

As the ſeventh day was a day of reſt to the people, ſo was the ſeventh year to the land; it being unlawful in this year to plow or ſow, and whatever the earth produced belonged to the poor: this was called the ſabbatical year. The Jews, therefore, were obliged, during the ſix years, and more eſpecially the laſt, to lay up a ſufficient ſtore for the ſabbatical year.

The modern, as well as the ancient, Jews, are very ſuperſtitious in the obſervance of the ſabbath; they carry neither arms, nor gold nor ſilver about them, and are permitted neither to touch theſe, nor a candle, nor any thing belonging to the fire; on which account they light up lamps on Friday, which burn till the end of the ſabbath.

SABBELLIANS, a ſect of Chriſtians of the IIId century, that embraced the opinions of Sabellius, a philoſopher of Egypt, who openly taught that there is but one perſon in the Godhead.

The Sabellians maintained, that the Word and the Holy Spirit are only virtues, emanations, or functions of the Deity: and held, that he who is in heaven is the Father of all things, deſcended into the virgin, became a child, and was born of her as a ſon; and that having accompliſhed the myſtery of our ſalvation, he diffuſed himſelf on the apoſtles in tongues of fire, and was then denominated the Holy Ghoſt. This they explained by reſembling God to the ſun, the illuminative virtue or quality of which was the Word, and its warming virtue the Holy Spirit. The Word, they taught, was darted, like a divine ray, to accompliſh the work of redemption; and that, being re aſcended to heaven, the influences of the Father were communicated after a like manner to the apoſtles.

SABINA, in botany. See JUNIPERUS.

SABINA, a province of Italy, in the pope's territories, bounded by Umbria on the north, by Naples on the eaſt, by the Campania of Rome on the ſouth, and by St Peter's Patrimony on the weſt.

SABLE, in zoology. See MUSTELA.

SABLE, in heraldry, denotes the colour black, in coats of arms belonging to gentlemen; but in thoſe of noblemen it is called diamond; and in thoſe of ſovereign princes, Saturn. See COLOUR.

It is expreſſed in engraving by perpendicular and horizontal hatches croſſing one another, as repreſented in Plate CXLVII. fig. 13.

SABLUSTAN, a province of Perſia, which comprehending Gaur and Candahor, is bounded by Choraſſan on the north, by India on the eaſt, and by Sigiſtian on the ſouth.

RABRE, a kind of ſword or ſcimiter, with a very broad and heavy blade, thick at the back, and a little falcated or crooked towards the point: it is the ordinary weapon worn by the Turks, who are ſaid to be very expert in the uſe of it.

SABURRÆ, GRITTS, in natural hiſtory, a genus of foſſils, found in minute maſſes, forming together a kind of powder, the ſeveral particles of which are of no determinate ſhape, nor have any tendency to the figure of cryſtal, but ſeem rudely broken fragments of larger maſſes; not to be diſſolved or diſunited by water, but retaining their figure in it, and not cohering by means of it into a maſs; conſiderably opake, and in many ſpecies fermenting with acids; often fouled with heterogene matters, and not unfrequently taken in the coarſer ſtony and mineral or metalline particles.

Gritts are of various colours, as, 1. The ſtony and ſparry gritts, of a bright or greyiſh white colour. 2. The red ſtony gritts. 3. The green ſtony gritts, compoſed of homogene ſparry particles. 4. The yellow gritt, of which there is only one ſpecies, 5. The black and blackiſh gritts, compoſed of ſtony or talcy particles.

SACCADE, in the manege, is a jerk more or leſs violent, given by the horſeman to the horſe, in pulling or twitching the reins of the bridle all on a ſudden, and with one pull, and that when a horſe lies heavy upon the hand, or obſtinately arms himſelf.

SACCAI, a city and port-town of Japan, ſituated on the bay of Mecao, three hundred miles ſouth-weſt of Jeddo: E. long. 135°, and N. lat. 36.

SACCHARUM, in botany, a genus of the triandria digynia claſs. It has no calix, but long down in place of it; and the corolla has two valves. There are two ſpecies, both natives of India. See SUGAR.

SACCHARUM SATURNI, *ſugar of lead*, is thus ordered to be made in the London Diſpenſatory; boil ceruſs with diſtilled vinegar, until the vinegar becomes ſufficiently ſweet; then filter the vinegar through paper, and after due evaporation ſet it to cryſtallize.

SACCULUS, in anatomy, a diminutive of ſaccus, ſignifies a little bag, and is applied to many parts of the body. See ANATOMY.

SACER, in ornithology. See Falco.

SACERDOTAL, ſomething belonging to prieſts. See Priest.

SACK *of wool*, a quantity of wool containing juſt twenty-two ſtone, and every ſtone fourteen pounds. In Scotland, a ſack is twenty four ſtone, each ſtone containing ſixteen pounds.

Sack *of cotton wool*, a quantity from one hundred and a half to four hundred weight.

Sacks *of earth*, in fortification, are canvas bags filled with earth. They are uſed in making retrenchments in haſte, to place on parapets, or the head of the breeches, *&c.* to repair them, when beaten down.

SACKBUT, a muſical inſtrument of the wind kind, being a ſort of trumpet, though different from the common trumpet both in form and ſize: it is fit to play a baſs, and is contrived to be drawn out or ſhortened, according to the tone required, whether grave or acute. The Italians call it trombone, and the Latins tuba ductilis.

SACRAMENT, ſignifies, in general, a ſign of a thing ſacred and holy; and is defined to be an outward and viſible ſign of a ſpiritual grace. Thus there are two objects in a ſacrament, the one the object of the ſenſes, and the other the object of faith. Proteſtants admit only of two ſacraments, baptiſm and the euchariſt or Lord's ſupper; but the Roman-catholics own ſeven, *viz.* baptiſm, confirmation, the euchariſt, penance, extreme unction, ordination, and marriage.

The Romaniſts, however, by way of eminence, call the euchariſt the holy ſacrament. Thus to expoſe the holy ſacrament, is to lay the conſecrated hoſt on the altar to be adored. The proceſſion of the holy ſacrament, is that in which this hoſt is carried about the church, or about a town.

SACRAMENTARY, an ancient Romiſh church-book, which contains all the prayers and ceremonies practiſed at the celebration of the ſacraments.

It was wrote by pope Gelaſius, and afterwards reviſed, corrected, and abridged by St Gregory.

SACRED, ſomething holy, or that is ſolemnly offered and conſecrated to God, with benedictions, unctions, *&c.*

SACRIFICE, a ſolemn act of religious worſhip, which conſiſted in dedicating or offering up ſomething animate or inanimate on an altar, by the hands of the prieſt, either as an expreſſion of their gratitude to the Deity for ſome ſignal mercy, or to acknowledge their dependance on him, or to conciliate his favour. The origin of ſacrifices is by ſome aſcribed to the Phœnicians; but Porphyry aſcribes it to the Egyptians, who firſt offered the firſt-fruits of their grounds to the gods, burning them upon an altar of turf: thus in the moſt ancient ſacrifices there were neither living creatures, nor any thing coſtly or magnificent, and no myrrh or frankincenſe. At length they began to burn perfumes: and afterwards men leaving their ancient diet of herbs and roots, and beginning to uſe living creatures for food, they began alſo to change their ſacrifices. The ſcriptures, however, furniſh us with a different account: for Noah, it is ſaid, ſacrificed animals at his coming out of the ark; and even Abel himſelf ſacrificed the beſt and fatteſt of his flock; but Grotius thinks it more probable that he contented himſelf with making a mere oblation of his lambs, *&c.* without ſlaying them.

The Jews had two ſorts of ſacrifices, taking the word in its largeſt ſignification: The firſt were offerings of tythes, firſt-fruits, cakes, wine, oil, honey, and the like; and the laſt, offerings of ſlaughtered animals. When an Iſraelite offered a loaf or a cake, the prieſt broke it in two parts; and ſetting aſide that half which he reſerved for himſelf, broke the other into crumbs, poured oil, wine, incenſe, and ſalt upon it, and ſpread the whole upon the fire of the altar. If theſe offerings were accompanied with the ſacrifice of an animal, they were thrown upon the victim to be conſumed along with it. If the offerings were of the ears of new corn, they were parched at the fire, rubbed in the hand, and then offered to the prieſt in a veſſel, over which he poured oil, incenſe, wine and ſalt, and then burnt it upon the altar, having firſt taken as much of it as of right belonged to himſelf.

The principal ſacrifices among the Hebrews conſiſted of bullocks, ſheep, and goats; but doves and turtles were accepted from thoſe who were not able to bring the other; theſe beaſts were to be perfect, and without blemiſh. The rites of ſacrificing were various, all of which are very minutely deſcribed in the books of Moſes.

The manner of ſacrificing among the Greeks and Romans was as follows. In the choice of the victim, they took care that it was without blemiſh or imperfection; its tail was not to be too ſmall at the end; the tongue not black, nor the ears cleft; and that the bull was one that had never been yoked. The victim being pitched upon, they gilt his forehead and horns, eſpecially if a bull, heifer, or cow. The head they alſo adorned with a garland of flowers, a woollen infula or holy fillet, whence hung two rows of chaplets with twiſted ribbands; and on the middle of the body a kind of ſtole, pretty large, hung down on each ſide; the leſſer victims were only adorned with garlands and bundles of flowers, together with white tufts or wreaths.

The victims thus prepared were brought before the altar; the leſſer being driven to the place, and the greater led by an halter; when if they made any ſtruggle, or refuſed to go, the reſiſtance was taken for an ill omen, and the ſacrifice frequently was ſet aſide. The victim thus brought was carefully examined, to ſee that there was no defect in it: then the prieſt, clad in his ſacerdotal habit, and accompanied with the ſacrificers and other attendants, and being waſhed and purified according to the ceremonies preſcribed, turned to the right-hand and went round the altar, ſprinkling it with meal and holy-water, and alſo beſprinkling thoſe who were preſent. Then the crier proclaimed with a loud voice, Who is here? To which the people replied, Many and good. The prieſt then having exhorted the people to join with him by ſaying, Let us pray, confeſſed his own unworthineſs, acknowledging that he had been guilty of divers ſins; for which he begged pardon of the gods, hoping that they would be pleaſed to grant his requeſts, accept the oblations offered them, and ſend them all health and happineſs; and to this general form added petitions for ſuch particular favours as were then deſired. Prayers being ended, the prieſt took a cup of wine; and having taſted it himſelf, cauſed his aſſiſtants to do the like; and then poured forth the remainder between the horns of the victim. Then the prieſt or the crier, or ſometimes the moſt honourable perſon in the company, killed the beaſt, by

by knocking it down, or cutting its throat. If the facrifice was in honour of the celeftial gods, the throat was turned up towards heaven; but if they facrificed to the heroes or infernal gods, the victim was killed with its throat towards the ground. If by accident the beaft efcaped the ftroke, leaped up after it, or expired with pain and difficulty, it was thought to be unacceptable to the gods. The beaft being killed, the prieft infpected its entrails, and made predictions from them. They then poured wine, together with frankincenfe, into the fire, to increafe the flame, and then laid the facrifice on the altar; which in the primitive times was burnt whole to the gods, and thence called an holocauft; but in aftertimes, only part of the victim was confumed in the fire, and the remainder referved for the facrificers; the thighs, and fometimes the entrails, being burnt to their honour, the company feafted upon the reft. While the facrifice was burning, the prieft, and the perfon who gave the facrifice, jointly prayed, laying their hands upon the altar. Sometimes they played upon mufical inftruments in the time of the facrifice, and on fome occafions they danced round the altar, finging facred hymns in honour of the gods.

SACRIFICE, is alfo a name of an ifland in the gulph of Mexico, forty-five miles eaft of La Vera Cruz; it is fubject to the Spaniards.

SACRILEGE, the crime of profaning facred things, or thofe devoted to the fervice of God.

SACRISTAN, a church-officer, otherwife called fexton. See SEXTON.

SACRISTY, in church hiftory, an apartment in a church, where the facred utenfils were kept; being the fame with our veftry. See VESTRY.

SACRO LUMBARIS, in anatomy. See ANATOMY, p. 203.

SACRUM OS See ANATOMY, p. 170.

SADERASAPATAN, a port-town of the coaft of Cormandel forty miles fouth of Fort St George. Here the Dutch have a factory.

SADDLE, is a feat upon a horfe's back, contrived for the conveniency of the rider.

A hunting faddle is compofed of two bows, two bands, fore-bolfters, pannels, and faddle-ftraps; and the great faddle has, befides thefe parts, corks, hind-bolfters, and a trouffequin.

The pommel is common to both.

SADDUCEES, in Jewifh antiquity, a famous fect among the ancient Jews, fo called from their founder Sadoc. Antigonus of Socho, prefident of the fanhedrim at Jerufalem, and teacher of the law in the divinity fchool of that city. Having often, in his lectures, afferted to his fcholars, that they ought not to ferve God in a fervile manner, with refpect to reward, but only out of filial love and fear; two of his fcholars, Sadoc and Baithus, inferred from thence, that there were no rewards or punifhments after this life; and, therefore, feparating from the fchool of their mafter, they taught that there was no refurrection, nor future ftate. Many embracing this opinion, gave rife to the fect of the Sadducees, who were a kind of Epicureans, but differing from them in this, that though they denied a future ftate, yet they allowed the world was created by the power of God, and governed by his providence; whereas the followers of Epicurus denied both.

The Sadducees denied all manner of predeftination whatever; and not only rejected all unwritten traditions, but alfo all the books of the Old Teftament, excepting the Pentateuch.

SAFE GUARD, a protection formerly granted to a ftranger, who feared violence from fome of the king's fubjects, for feeking his right by courfe of law.

SAFFRON, in botany, *&c* See CROCUS.

Meadow SAFFRON, in botany. See COLCHICUM.

SAGAPENUM, in pharmacy, *&c.* a gum-refin, brought to us in two forms: the finer and purer is in loofe granules, or fingle drops; the coarfer kind is in maffes compofed of thefe drops of various fizes, cemented together by a matter of the fame kind. In either cafe, it is of a firm and compact fubftance, confiderably heavy, and of a reddifh colour on the outfide, brownifh within, and fpotted in many places with fmall yellowifh or whitifh fpecks. Its fmell is ftrong and difagreeable: its tafte acrid and unpleafant.

It is brought to us from Perfia and the Eaft-Indies.

Sagapenum is a very great attenuant, aperient, and difcutient; it is good in all diforders of the breaft that owe their origin to a tough phlegm.

SAGE, in botany. See SALVIA.

SAGENE, a Ruffian long meafure, five hundred of which make a werft: the fagene is equal to feven Englifh feet.

SAGINA, in botany, a genus of the tetrandria tetragynia clafs. The calix confifts of four leaves, and the corolla of four petals; the capfule has four cells, and four valves, containing many feeds. Thereare three fpecies, two of them natives of Britain, *viz.* the procumbens, or pearl wort; and the erecta, or the leaft ftitch wort.

SAGITTA. in aftronomy. See ASTRONOMY, p. 487.

SAGITTAL SUTURE, in anatomy. See ANATOMY, p. 152.

SAGITTARIA, in botany, a genus of the monœcia polyandria clafs. The calix of the male confifts of three fegments, and the corolla of three petals; and the ftamina are about 24. The calix and corolla of the female are the fame with thofe of the male; it has no piftillum; and the feeds are many, and naked. The fpecies are four, only one of them, *viz.* the fagittifolia, or arrow head, a native of Britain.

SAGITTARIUS, in aftronomy. See ASTRONOMY, p. 487.

SAGO, a fimple brought from the Eaft-Indies, of confiderable ufe in diet as a reftorative.

Sago is a fort of bread produced in the following manner, from a tree called landan, growing in the Moluccos. When a tree is felled, they cleave it in two in the middle, and dig out the pith, which is eatable, when it comes frefh out of the tree. They pound it in a mortar, till it is reduced into a kind of powder fomewhat like meal. Then they put in a fearce made of the bark of the fame tree, placing it over a ciftern made of its leaves, and pour water on it, which feparates the pure part of the powder from the woody fibres wherewith the pith abounds. The flour thus filtrated they call fagu, which they make into pafte, and bake it in earthen furnaces.

SAGREE, in ichthyology. See SQUALUS.

SAICK, or SAIQUE, a Turkifh veffel, very common in the Levant for carrying of merchandize.

SAIL, in navigation, an affemblage of feveral breadths of

canvas, sewed together by the lists, and edged round with a cord, fastened to the yards of a ship, to make it drive before the wind. See Ship.

SAILING, properly denotes the art of navigating and working a ship, or of causing her to observe such motions and directions as are assigned by the navigator; in which sense, sailing differs from navigation, and must be learned by practice on shipboard. See Navigation.

SAINT, in the Romish church, a holy person deceased, and since his decease canonized by the pope, after several informations and ceremonies. See Canonization.

Saint-foin, in botany. See Hedysarum, and Agriculture, p. 65.

Sal, one of the islands of cape Verd, situated in the Atlantic ocean: W. long. 23°, lat. 17°.

SALAMANCA, a city of Spain in the province of Leon, situated on the river Tormes: W. long. 6° 10′, N. lat. 41°.

SALAMANDER, in zoology. See Lacerta.

SALAMIS, an island in the gulph of Engia, in European Turky, situated in E. long. 34°, N. lat. 37° 32′, being about fifty miles in circumference.

SALEM, a port-town of New England, a little north of Boston.

SALEP, in the materia medica, the root of a species of orchis. See Orchis.

Salep should be chosen clean, firm and hard: it is very little liable either to decay or sophistication. The salep differs very little from the common orchis in virtue. Its appearance is owing to the manner of preparing it, and consequently this may be done from the roots of orchis of our own growth. To prepare these in imitation of salep, Mr. Geoffroy chose the largest, fairest, and plumpest roots he could find: these he nicely skinned; then throwing them into cold water, he suffered them to macerate there for some time: after this he lightly boiled them, and then taking them out of the water and draining them, he had them strung upon threads to be dried in a warm dry air: when the roots were thoroughly dried, they were very transparent, and resembled pieces of tragacanth, and continued dry and hard. The roots thus prepared may be reduced to powder, which will dissolve away in boiling water; and a scruple of it will make a bason full of jelly, in the manner of the Turkish salep. This jelly is an admirable medicine in all cases in which salep is prescribed; and the powder may be given with great success in asses-milk for diseases of the breast.

SALERNO, a city and port-town of Italy, in the kingdom of Naples and the hither principate, situated on a bay of the Tuscan sea: E. long. 15° 20′, N. lat. 40° 40′.

SALET, in war, a light covering or armour for the head, anciently worn by the light horse, only differing from the cask in that it had no crest, and was little more than a bare cap.

SALIANT, in fortification, denotes projecting. There are two kinds of angles, the one saliant, which are those that present their point outwards; the other re-entering, which have their points inwards. See Fortification.

Saliant, Salient, or Saillant, in heraldry, is applied to a lion, or other beast, when its fore-legs are raised in a leaping posture. See Plate CXLVII. fig. 14.

SALIC, or Salique law, an ancient and fundamental law of the kingdom of France, usually supposed to have been made by Pharamond, or at least by Clovis, in virtue whereof males are only to inherit.

SALICORNIA, in botany, a genus of the monandria monogynia class. The calix is ventricose and entire; it has no corolla, and but one seed. The species are four, only one of them, *viz.* the europæa, or marsh sampire, a native of Britain.

SALII, in Roman antiquity, priests of Mars, whereof there were twelve, instituted by Numa, wearing painted particoloured garments and high bonnets, with a steel-cuirasse on the breast. They were called salii from *saltare*, to dance; because, after assisting at sacrifices, they went dancing about the streets, with bucklers in the left hand, and a rod in the right, striking musically on one another's bucklers with their rods, and singing hymns in honour of the gods.

SALINA, anciently Salamis, a port-town of the island of Cyprus, situated on the south side of the island, in E. long. 34° 30′, and N. lat. 34° 30′.

SALINE, a name given to a preparation of sea-salt, procured from the froth of the sea, hardened by the sun in hot countries. It is called by some authors pilatro de Levante, and is used in glass-making; and in the making the fine purple colour from cochineal, by boiling it in a small quantity, with the bran and fœnugreek, of which the magistery is made for that purpose.

SALISBURY, the capital city of Wiltshire, situated eighty miles west of London, and thirty-five miles south-east of Bristol. It sends two members to parliament.

SALIVA, spittle, a thin pellucid humour, separated from the arterial blood, by the glands about the mouth and fauces, and conveyed, by proper salival ducts, into the mouth, for several uses. See Anatomy, p. 307.

SALIVAL, an epithet applied to the glands and ducts which supply and secrete the saliva. See Anatomy, p. 307.

SALIVATION, in medicine, a promoting of the flux of saliva, by means of medicines, mostly by mercury. The chief use of salivation is in diseases belonging to the glands and the membrana adiposa, and principally in the cure of the venereal disease, though it is sometimes also used in epidemic diseases, cutaneous diseases, *&c.* whose crises tend that way. See Medicine.

SALIX, in botany, a genus of the diœcia diandria class. The amentum of both male and female consists of scales; none of them have any corolla; the stylus is bifid; the capsule has but one cell, and two valves; and the seeds are pappous. There are 31 species, 18 of them natives of Britain.

SALEE, a port-town of the empire of Morrocco, in the kingdom of Fez, situated on the coast of the Atlantic ocean: W. long. 7°, and N. lat. 34°.

SALLY, in the military art, the issuing out of the besieged from their town or fort, and falling upon the besiegers in their works, in order to cut them off, nail their cannon, hinder the progress of their approaches, destroy their works, *&c.*

SALMO, in ichthyology, a genus belonging to the order of abdominales: The head is smooth, and furnished with teeth, and a tongue; the rays of the gills are from four to ten; the back fin is fat behind; and the belly-fins have many rays. There are 29 species.

SALMON-fishing. See Fishery.

SALOON, in architecture, a very lofty ſpacious hall, vaulted at top, and ſometimes comprehending two ſtories or ranges of windows.

SALONICHI, a city and port-town of Macedon, in Turky, anciently called Theſſalonica, two hundred and ſixty miles weſt of Conſtantinople: E long. 24°, N. lat. 41°.

SALPA, in ichthyology. See SPARUS.

SALSETTE, an iſland on the weſtern coaſt of the hither India, ſeparated from that of Bombay by a narrow channel: it belongs to the Portugueſe, and is twenty miles long, and ſeventeen broad.

SALSOLA, in botany. See KALI.

SALT, the name of a ſeries or ſubdiviſion of foſſils, naturally and eſſentially ſimple, not inflammable, and ſoluble in water. See CHEMISTRY, p. 122, &c.

SALTIER, in heraldry, an ordinary in form of a St. Andrew's croſs; which may be ſaid to be compoſed of a bend dexter and ſiniſter, croſſing each other in the centre of the eſcutcheon. See Plate CXLVII fig. 15.

SALT-PETRE. See NITRE.

SALTSBURG, the capital of an archbiſhopric of the ſame name, in Bavaria, ſituated on the river Saltza, ſeventy miles eaſt of Munich: E. long. 13°, N. lat. 47° 45′.

SALVADORA, in botany, a genus of the tetrandria monogynia claſs. The calix has four ſegments; it has no corolla; the berry contains but one ſeed, furniſhed with an awn There is one ſpecies, a native of India.

SALVAGE MONEY, a reward allowed by the civil and ſtatute law, for the ſaving of ſhips or goods from the danger of the ſeas, pirates, or enemies.

Where any ſhip is in danger of being ſtranded, or driven on ſhore, juſtices of the peace are to command the conſtables to aſſemble as many perſons as are neceſſary to preſerve it; and on its being preſerved by their means, the perſons aſſiſting therein ſhall in thirty days after be paid a reaſonable reward for their ſalvage, otherwiſe the ſhip or goods ſhall remain in the cuſtody of the officers of the cuſtoms as a ſecurity for the ſame

SALVIA, in botany, a genus of the diandria monogynia claſs. The corolla is unequal; and the filaments fixed tranſverſely to a pedicle. There are 32 ſpecies, two of them natives of Britain, *viz.* the pratenſis, or meadow-clary; and the verbera, or wild-clary.

SALUTATION, the act of ſaluting, greeting, or paying reſpect and reverence to any one.

There is a great variety in the forms of ſalutation. The orientals ſalute by uncovering their feet, laying their hands on their breaſts, &c. In Britain, we ſalute by uncovering the head, bending the body, &c. The pope makes no reverence to any mortal, except the emperor, to whom he ſtoops a very little, when he permits him to kiſs his lips.

SALUZZO, a city of Italy, the capital of a marquiſate of the ſame name in Piedmont, ſeventeen miles ſouth of Turin.

SAMARCAND, a city of Uſbec Tartary, formerly its capital: E. long. 66°, N. lat. 40°.

SAMARIA, an ancient city of Paleſtine, in Aſiatic Turky, forty five miles north of Jeruſalem.

SAMARITANS, an ancient ſect among the Jews, ſtill ſubſiſting in ſome parts of the Levant, under the ſame name

Its origin was in the time of Rehoboam, under whoſe reign the people of Iſrael were divided into two diſtinct kingdoms, that of Judah and that of Iſrael; when the capital of the latter being Samaria, the Iſraelites obtained the name of Samaritans.

They were anciently guilty of idolatry, and the rabbins pretend, that they worſhipped the figure of a dove on mount Gerizim; but the preſent Samaritans, who are but few in number, are far from being idolaters. They celebrate the paſſover every year, on the fourteenth day of the firſt month, on mount Gerizim, and begin that feaſt with the ſacrifice appointed for that purpoſe in Exodus: they keep the ſabbath with all the rigour with which it is injoined in the book of Exodus, none among them ſtirring out of doors but to the ſynagogue: they ſacrifice nowhere but on mount Gerizim: they obſerve the feaſts of expiation, tabernacles, harveſt, &c. and never defer circumciſion beyond the eighth day; they never marry their nieces, as the Jews do; have but one wife; and in fine, do nothing but what is commanded in the law.

SAMBALLAS, or SAMBLAS ISLANDS, ſeveral iſlands ſituated in the American ocean, near the coaſt of Darien, none of which are inhabited: E. long. 81°, N lat. 10°.

SAMBUCUS, in botany, a genus of the pentandria trigynia claſs. The calix and corolla conſiſt of five ſegments; and the berry contains three ſeeds. There are four ſpecies, two of them natives of Britain, *viz.* the nigra, or common elder; and the ebulus, or dwarf elder.

The inner green bark of this ſhrub is gently cathartic.

SAMIAN EARTH, in the materia medica, the name of two ſpecies of marle uſed in medicine, *viz.* 1. The white kind, called by the ancients collyrium ſamium; being aſtringent, and therefore good in diarrhæas, dyſenteries, and hæmorrhages; they alſo uſed it externally in inflammations of all kinds. 2. The browniſh white kind, called after ſamius, by Dioſcorides: this alſo ſtands recommended as an aſtringent.

SAMOGITIA, a maritime province of Poland, bounded by Courland on the north, and by the Baltic on the weſt.

SAMOIDA, the moſt northerly province of Ruſſia in Europe, ſituated on the frozen ocean, and the river Oby.

SAMOLUS, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated; the ſtamina are fortified by ſcales; and the capſule has one cell. There is but one ſpecies, *viz.* the valerandi, or round-leaved water pimpernel, a native of Britain.

SAMOS, a fertile iſland of the Archipelago, thirty miles ſouth of Smyrna: E long. 27° 30′, N lat. 37° 30′.

SAMOTHRACIA, a ſmall iſland in the Egean ſea, near the coaſt of Thrace.

SAMPSEANS, in church-hiſtory, an ancient ſect, who were properly neither Jews, Chriſtians, nor Gentiles, though they took their name from the Hebrew word *ſemes*, ſun; as though they worſhipped that planet.

They acknowledged only one God; waſhed themſelves often; and in almoſt every thing attached themſelves to the religion of the Jews.

Books of SAMUEL; two canonical books of the Old Teſtament, ſo called as being uſually aſcribed to the prophet Samuel.

The books of Samuel, and the books of Kings, are a continued hiſtory of the reigns of the Kings of Iſrael and Judah; for which reaſon the books of Samuel are likewiſe

wife ſtyled the firſt and ſecond books of Kings. Since the firſt twenty-four chapters contain all that relates to the hiſtory of Samuel, and the latter part of the firſt book, and all the ſecond, include the relation of events that happened after the death of that prophet, it has been ſuppoſed that Samuel was author only of the firſt twenty-four chapters, and that the prophets Gad and Nathan finiſhed the work. The firſt book of Samuel comprehends the tranſactions under the government of Eli, and Samuel; and under Saul, the firſt king; and alſo the acts of David, whilſt he lived under Saul; and is ſuppoſed to include the ſpace of a hundred and one years. The ſecond book contains the hiſtory of about forty years, and is wholly ſpent in relating the tranſactions of king David's reign.

SAMYDA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five coloured leaves; it has no corolla; and the berry has three valves, and one cell. There are five ſpecies, none of them natives of Britain.

SANCTIFICATION, the act of ſanctifying, or rendering a thing holy.

The reformed divines define ſanctification to be an act of God's grace, by which a perſon's deſires and affections are alienated from the world, and by which he is made to die to ſin, and to live to righteouſneſs; or, in other words, to feel an abhorrence of all vice, and a love of virtue and religion.

SANCTION, the authority given to a judicial act, by which it becomes legal and authentic.

SANCTUARY, among the Jews, alſo called Sanctum ſanctorum, or Holy of holies, was the holieſt and moſt retired part of the temple of Jeruſalem, in which the ark of the covenant was preſerved, and into which none but the high prieſt was allowed to enter, and that only once a year, to intercede for the people. Some diſtinguiſh the ſanctuary from the ſanctum ſanctorum, and maintain that the whole temple was called the ſanctuary.

To try and examine any thing by the weight of the ſanctuary, is to examine it by a juſt and equal ſcale: becauſe, among the Jews, it was the cuſtom of the prieſts to keep ſtone weights, to ſerve as ſtandards for regulating all weights by, though theſe were not at all different from the royal, or profane weights.

Sanctuary, in the Romiſh church, is alſo uſed for that part of the church in which the altar is placed, encompaſſed with a rail or baluſtrade.

SANCTUARY, in our ancient cuſtoms, is the ſame with aſylum. See ASYLUM.

SAND, in natural hiſtory, a genus of foſſils, the characters of which are, that they are found in minute concretions; forming together a kind of powder, the genuine particles of which are all of a tendency to one determinate ſhape, and appear regular, though more or leſs compleat concretions; not to be diſſolved or diſunited by water, or formed into a coherent maſs by means of it, but retaining their figure in it; tranſparent, vitrifiable by extreme heat, and not diſſoluble in, nor effervefcing with, acids. Sands are ſubject to be variouſly blended both with homogene and heterogene ſubſtances, as that of talcs, *&c.* and hence, as well as from their various colours, are ſubdivided into a number of ſpecies.

SAND-BAGS, in the art of war, are bags filled with earth or ſand, holding each about a cubic foot: their uſe is to raiſe parapets in haſte, or to repair what is beaten down.

SANDECK, a town of little Poland, thirty-five miles ſouth-eaſt of Cracow.

SAND-EEL, *ammodytes*, in ichthyology. See AMMODYTES.

SANDAL, in antiquity, a rich kind of ſlipper worn on the feet by the Greek and Roman ladies, made of gold, ſilk, or other precious ſtuff, conſiſting of a ſole, with an hollow at one extreme to embrace the ancle, but leaving the upper part of the foot bare.

Sandal, is alſo uſed for a ſhoe or ſlipper worn by the pope, and other Romiſh prelates, when they officiate. It is alſo the name of a ſort of ſlipper worn by ſeveral congregations of reformed monks. This laſt conſiſts of no more than a mere leathern ſole, faſtened with latches or buckles, all the reſt of the foot being left bare. The capuchins wear ſandals; the recollects, clogs: the former are of leather, and the latter of wood.

SANDARACH, in natural hiſtory, a very beautiful native foſſil, though too often confounded with the common factitious red arſenic, and with the red matter formed by melting the common yellow orpiment.

It is a pure ſubſtance, of a very even and regular ſtructure, is throughout of that colour which our dyers term an orange-ſcarlet, and is conſiderably tranſparent even in the thickeſt pieces. But though, with reſpect to colour, it has the advantage of cinnabar while in the maſs, it is vaſtly inferior to it when both are reduced to powders. It is moderately hard, and remarkably heavy, and, when expoſed to a moderate heat, melts and flows like oil: if ſet on fire, it burns very briſkly.

It is found in Saxony and Bohemia, in the copper and ſilver mines; and is ſold to the painters, who find it a very fine and valuable red: but its virtues or qualities in medicine, are no more aſcertained at this time, than thoſe of the yellow orpiment.

Gum-SANDARACH, is a dry and hard reſin, uſually met with in looſe granules, of the bigneſs of a pea, a horſe-bean, or larger; of a pale whitiſh yellow, tranſparent, and of a reſinous ſmell, brittle, very inflammable, of an acrid and aromatic taſte, and diffuſing a very pleaſant ſmell when burning. It is produced from a ſpecies of the juniper.

It flows only from theſe trees in hot countries; but the natives promote its diſcharge by making inciſions in the bark.

Sandarach is good in diarrhœas, and in hæmorrhages.

The varniſh-makers make a kind of varniſh of it by diſſolving it in oil of turpentine or linſeed, or in ſpirit of wine.

SANDIVER, a whitiſh ſalt, continually caſt up from the metal, as it is called, whereof glaſs is made; and, ſwimming on its ſurface, is ſkimmed of.

Sandiver is alſo plentifully thrown out in the eruptions of volcanos; ſome is of a fine white, and others tinged bluiſh or yellowiſh.

Sandiver is detergent, and good for foulneſſes of the ſkin. It is alſo uſed by gilders of iron.

SANDIX, a kind of minium, or red-lead, made of ceruſe, but much inferior to the true minium.

SANDWICH, one of the cinque-ports, in Kent, ten miles eaſt of Canterbury: it ſends two members to parliament, and gives the title of Earl to the noble family of Montague.

SANGUI-

SANGUIFICATION, in the animal œconomy, the converſion of chyle into true blood. See Chyle.

SANGUINARIA, blood-wort, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of eight petals, and the calix of two leaves; the pod is oval, with one cell. There is but one ſpecies, a native of America.

SANGUINE, in general, ſomething abounding with, or reſembling blood. See Blood.

SANGUIS. See Blood.

SANGUISORBA, in botany, a genus of the tetrandria monogynia claſs. The calix has two leaves; and the germen is ſituate between the calix and corolla. There are three ſpecies, only one of them, *viz.* the officinalis, or burnet, a native of Britain, the leaves of which are mildly aſtringent.

SANHEDRIM, among the Jews, the great council of the nation, conſiſting of ſeventy ſenators, taken partly from among the prieſts and levites, and partly out of the inferior judges, who formed what was called the leſſer ſanhedrim. The room they met in was a rotunda, half of which was built without the temple, and half within. The naſi, or preſident of the ſanhedrim, ſat upon a throne, with his deputy on his right hand, his ſub-deputy on his left, and the other ſenators ranged in order on each ſide.

The authority of this council was very extenſive: for they decided ſuch cauſes as were brought before them by way of appeal from the inferior courts; and the king, the high-prieſts, and prophets, were under the juriſdiction of this tribunal. They had the right of judging in capital caſes, and ſentence of death might not be pronounced in any other place; for which reaſon the Jews were forced to quit this hall, when the power of life and death was taken out of their hands, forty years before the deſtruction of the temple, and three years before the death of Chriſt.

There were ſeveral inferior ſanhedrims in Paleſtine, each of which conſiſted of twenty-three perſons; all theſe depended on the great ſanhedrim of Jeruſalem.

SANICULA, in botany, a genus of the pentandria digynia claſs. The umbellæ are thick; the fruit is rough; and the flowers of the diſk are abortive. The ſpecies are three, only one of them, *viz.* the europæa, or ſanicle, is a native of Britain. The leaves are ſuppoſed to be vulnerary.

SANIDIUM, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, but neither of the rhomboidal nor columnar kinds, nor any other way diſtinguiſhable by its external figure, being made up of ſeveral plain flat plates.

SANIES, in medicine, a ſerous putrid matter, iſſuing from wounds; it differs from pus, which is thicker and whiter.

SANQUHAR, a borough-town of Scotland, in the county of Nithſdale, twenty-one miles north of Dumfries.

Santa clara, an iſland in the Pacific Ocean, ſituated in the bay of Guayquil: W. long. 80°, S. lat. 3° 15′.

Santa cruz, a port-town on the north ſide of the iſland of Cuba, in North America: W. long. 85° 30′, N. lat. 22° 30′.

Santa fe, the capital of New Mexico: W. long. 109°, N. lat. 36°.

Santa fe de bagota, the capital of Terra Firma, in South America: W. long. 74°, N. lat. 4° 30′.

Santa maria, a town of Terra Firma, in the province of Darien, ſituated on a river of the ſame name, a little eaſt of the bay of Panama: W. long. 80°, N. lat 7° 40′.

SANTALUM, in botany, a genus of the octandria monogynia claſs. The corolla conſiſts of one petal; the ſtamina lie upon the tube; the ſtigma is ſimple; and the fruit is a berry. There is but one ſpecies, a native of India. The wood is reckoned to be attenuant and cordial.

SANTILLANA, a city and port-town of Spain, the capital of the eaſtern Aſturia, ſituated on the bay of Biſcay: W. long. 5°, and N. lat. 43° 35′

SANTOLINA, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is paleaceous; the pappus is very ſhort; and the calix is hemiſpherical and imbricated. The ſpecies are four, none of them natives of Britain.

SANTORINI, an iſland of the Archipelago, thirty-five miles in circumference: E. long. 25° 35′, N. lat. 36° 10′.

SAONE, a river of France, which riſes in Lorrain, and falls into the Rhone at Lyons.

SAP, a juice furniſhed by the earth, and changed into the plant. See Agriculture, p. 45.

SAPHENA, in anatomy. See Anatomy, p. 243.

SAPIENZA, an iſland and cape in the mediterranean ſea, on the ſouth-weſt point of the Morea, E. long. 21° 15′, N. lat. 36° 45′.

SAPPHIC, in poetry, a kind of verſe much uſed by the Greeks and Latins, denominated from the inventreſs Sappho. The Sapphic verſe conſiſts of five feet, whereof the firſt, fourth, and fifth are trochees, the ſecond a ſpondee, and the third a dactyl.

SAPINDUS, in botany, a genus of the octandria digynia claſs. The calix conſiſts of four leaves; and the corolla of four petals; and there are three round, connate, ventricoſe capſules. The ſpecies are three, none of them natives of Britain.

SAPO. See Soap.

SAPONARIA, in botany, a genus of the decandria digynia claſs. The calix conſiſts of one leaf, and the corolla of five clawed petals; and the capſule is oblong, with one cell. There are ſix ſpecies, only one of them, *viz.* the officinalis, or ſoap-wort, a native of Britain. The root of this ſpecies is ſuppoſed to be aperient, corroborant, and ſudorific.

SAPPHIRE, a pellucid gem, which, in its fineſt ſtate, is extremely beautiful and valuable, and ſecond only to the diamond in luſtre, hardneſs, and price. Its proper colour is a pure blue; in the fineſt ſpecimens it is of the deepeſt azure, and in others varies into paleneſs in ſhades of all degrees, between that and a pure cryſtal brightneſs and water, without the leaſt tinge of colour, but with a luſtre much ſuperior to the cryſtal. They are diſtinguiſhed into four ſorts, *viz.* the blue ſapphire, the white ſapphire, the water ſapphire, and the milk ſapphire.

The gem known to us by this name is extremely different from the ſapphire of the ancients, which was only a ſemi-opake ſtone, of a deep blue, veined with white, and ſpotted with ſmall gold-coloured ſpangles, in the form of ſtars, and was only a more beautiful kind of the lapis lazuli: but our ſapphire they have deſcribed under the name of beryllus aeroides, or the ſky-blue beryl.

The fineſt ſapphires in the world are brought from the kingdom

kingdom of Pegu in the East-Indies, where some are found perfectly colourless, and others of all the shades of blue; these are all found in the pebble-form. We have very fine sapphires also, partly pebble, partly crystal-shaped, from Bisnagar, Conanor, Calicut, and the island of Ceylon: these also are of all the shades of blue. And in Ceylon there are sometimes found a sort of bastard gems, of a mixed nature between the sapphire and ruby. The occidental are from Silesia, Bohemia, and many other parts of Europe; but though these are often very beautiful stones, they are greatly inferior, both in lustre and hardness, to the oriental.

SAPPHIRINE WATER, in the materia medica, also called blue eye-water, is thus prepared: Pour a pint of lime-water, made strong and fresh, into a copper-vessel, add to it a dram of crude sal armoniac, and throw in some filings or small pieces of copper, and let it stand till it has acquired a beautiful colour.

This is used as an eye-water; as also to deterge old ulcers: and sometimes it is mixed with other things in injections in gonorrhœas.

SARABAITES, a sort of monks among the ancient christians, who did not resort to the wilderness as others did, but lived publicly in cities. Two or three of them usually dwelt together, but they had no rule or government; they however observed very strict fasts; wore loose sleeves, wide stockings, coarse clothes, frequently sighed, and always bitterly inveighed against the clergy.

SARABAND, a musical composition in triple time, the motions of which are slow and serious.

SARACENS, the inhabitants of Arabia; so called from the word *sara*, which signifies a desart, as the greatest part of Arabia is: and this being the country of Mahomet, his disciples were called Saracens.

SARAGOSSA, the capital of the province of Arragon in Spain: W. long 1° 15′, and N lat. 41° 32′.

SARCASM, in rhetoric, a keen bitter expression which has the true point of satire, by which the orator scoffs and insults his enemy: such was that of the Jews to our Saviour, "He saved others, himself he cannot save"

SARCOCELE, in surgery, a spurious rupture, or hernia, wherein the testicle is considerably tumified or indurated, like a scirrhus, or much enlarged by a fleshy excrescence, which is frequently attended with acute pains and sometimes ulceration, so as to degenerate at last into a cancerous disposition. See SURGERY.

SARCOCOLLA, in pharmacy, a gum-resin, which approaches greatly to the nature of the simple gums.

It is brought to us from Persia and Arabia, in small granules moderately heavy, and of a whitish, brownish, or reddish colour, very friable, of a faintish disagreeable smell, and of an acrid and nauseous taste.

Hoffman absolutely condemns the internal use of it. However, it is recommended in ophthalmias, and defluctions of a sharp matter upon the eyes; and is generally ordered to be dissolved in milk for this purpose.

SARCOLOGY is that part of anatomy which treats of the soft parts, *viz.* the muscles, intestines, arteries, veins, nerves, and fat. See ANATOMY.

SARCOMA, in surgery, denotes any fleshy excrescence.

SARCOPHAGOUS MEDICINES, in surgery, *&c.* are those which eat away proud flesh, and otherwise called caustics. See CAUSTICS.

SARCOTICS, in surgery, medicines which generate flesh in wounds.

SARDINIA, an island of the Mediterranean, situated between 8° and 10° E. long. and between 39° and 41° N. lat. It is about one hundred and forty miles long, and sixty broad; and gives the title of king to the duke of Savoy, under whose dominion it is.

SARDIS, the ancient capital of Lydia, in Asia, now in ruins.

SARDONYX, in natural history, a genus of semi-pellucid gems, of the onyx structure, zoned or tabulated, and composed of the matter of the onyx variegated with that of the red or yellow carnelian. See CARNELIAN and ONYX.

SARGUS, in ichthyology. See SPARUS.

SARK, a little island between Guernsey and Jersey, subject to Great Britain.

SAROTHRA, in botany, a genus of the pentandria trigynia class. The calix consists of five segments, and the corolla of five petals; the capsule is coloured, and has three cells and one valve. There is but one species, a native of Virginia.

SARSAPARILLA, in botany. See SMILAX.

SARTORIUS, in anatomy. See ANATOMY, p. 207.

SARUM, or OLD SARUM, a borough-town of Wiltshire, situated a little north of Salisbury. It sends two members to parliament.

SASSAFRAS, in botany. See LAURUS.

The wood is imported in large straight blocks: it is said to be warm, aperient, and corroborant; and frequently employed, with good success, for purifying and sweetening the blood and juices; for which purpose an infusion, in the way of tea, is a very pleasant drink: its oil is very fragrant, and possesses most of the virtues of the wood.

SATELLITE in astronomy, the same with a secondary planet, or moon. See ASTRONOMY.

SATRAPA, or SATRAPES, in Persian antiquity, denotes an admiral; but more commonly the governor of a province.

SATTIN a glossy kind of silk stuff, the warp of which is very fine, and stands out so as to cover the coarser woof.

SATTINET, a slight thin kind of sattin, commonly striped, and chiefly used by the ladies for summer night-gowns.

SATURANTS, in pharmacy. See ABSORBENTS.

SATURATION, in chemistry, is the impregnating an acid with an alkali, or *vice versa*, till either will receive no more, and the mixture will become neutral.

SATURDAY, the seventh or last day of the week, so called from the idol Seater, worshipped on this day by the ancient Saxons, and thought to be the same as the Saturn of the Latins.

SATUREIA in botany, a genus of the didynamia gymnospermia class. The laciniæ of the corolla are nearly equal; and the stamina are approximate. The species are nine, none of them natives of Britain.

The leaves of summer-savory are very pungent, warm, and aromatic; and afford, in distillation with water, a subtile essential oil. Both are esteeemed good in crudities of the stomach, asthmas, and menstrual obstructions.

SATURN, in astronomy. See ASTRONOMY, p. 442.

SATURN, in chemiftry, &c. an appellation given to lead: See CHEMISTRY, p. 84, 136.

SATURN, in heraldry, denotes the black colour, in blazoning the arms of fovereign princes.

SATURNALIA, in Roman antiquity, a feftival obferved about the middle of December, in honour of the god Saturn, whom Lucan introduces giving an account of the ceremonies obferved on this occafion thus: "During my whole reign which lafts but for one week, no public bufinefs is done; there is nothing but drinking, finging, playing, creating imaginary kings, placing fervants with their mafters at table, &c. There fhall be no difputes, reproaches &c. but the rich and poor, mafters and flaves, fhall be equal," &c.

On this feftival the Romans facrificed bare-headed, contrary to their cuftom at other facrifices.

SATURNINE, an appellation given to perfons of a melancholy difpofition, as being fuppofed under the influence of the planet faturn

SATYRE, in the heathen mythology, a fabulous kind of demi-god, or rural deity, of the ancient Romans, reprefented with goat's feet, and fharp pricked up ears.

SATYR, or SATIRE, in matters of literature, a difcourfe or poem, expofing the vices and follies of mankind.

The chief fatyrifts among the ancients are Horace, Juvenal, and Perfius: thofe among the moderns, Regnier, and Boileau, in French; and Dryden, Oldham, Rochefter, Buckingham, Pope, Young, &c. among the Englifh.

SATYRIUM, a genus of the gynandria diandria clafs. The nectarium refembles a fcrotum, placed behind the flower. The fpecies are eight, 4 of them natives of Britain.

SAVANNA, a town and river of Georgia, in North-America: W. long. 81° 20′, N lat. 32°.

SAUCISSE, or SAUSAGE, in the military art, a long train of powder, fewed up in a roll of pitched cloth, about two inches in diameter, ferving to fet fire to mines.

SAUCISSON, in fortification, a mafs of large branches of trees bound together; and differing only from a fafcine, as this is compofed of fmall branches of twigs.

Sauciffons are employed to cover the men, and to make epaulements.

SAVE, a large river of Germany which rifing in Carinthia, runs eaft through Carniola and Croatia, and dividing Sclavonia from Turky, difcharges itfelf into the Danube at Belgrade.

SAVIN, in botany. See JUNIPERUS.

SAVIOUR, an appellation peculiarly given to Jefus Chrift, as being the true Meffiah, and Saviour of the world.

Order of St SAVIOUR a religious order in the Romifh church, founded by St Bridget, about the year 1345; and fo called from its being pretended that our Saviour himfelf dictated to the foundrefs its conftitutions and rules.

According to the conftitutions, this order is principally founded for religious women who pay a particular honour to the holy virgin: but there are fome monks of the order, to adminifter the facraments, and fpiritual affiftance to the nuns.

SAUMUR, a city of France, in the province of Orleanois, and duchy of Anjou; twenty-four miles eaft of Anjou.

SAUNDERS. See SANTALUM.

SAVOLAXIA, a fubdivifion of Finland, in Ruffia, fituated between Cajania, Kexholm, Carelia, and Bothnia.

SAVORY, in botany. See SATUREIA.

SAVOUR. See TASTE.

SAVOY, a duchy, fituated between France and Italy, on the weft fide of the Alps; bounded by the lake and territory of Geneva, on the north; by Switzerland and Piedmont, on the eaft; by another part of Piedmont and Dauphine, on the fouth; and by Franche Compte and Dauphine, on the weft

SAUVAGESIA, in botany, a genus of the pentandria monogynia clafs. The calix confifts of five leaves, and the corolla of five fimbriated petals; the nectarium has five leaves, lying alternately between the petals; and the capfule has one cell. There is but one fpecies, a native of Jamaica

SAW, an inftrument which ferves to cut into pieces feveral folid matters; as wood, ftone, ivory &c.

The beft faws are of tempered fteel ground bright and fmooth: thofe of iron are only hammer hardened: hence, the firft, befides their being ftiffer, are likewife found fmoother than the laft. They are known to be well hammered by the ftiff bending of the blade; and to be well and evenly ground, by their bending equally in a bow.

SAW-FISH. See SQUALUS.

SAXIFRAGA, in botany, a genus of the decandria digynia clafs. The calix confifts of five fegments, and the corolla of five petals; the capfule has a double beak and one cell. The fpecies are 38 nine of them natives of Britain

The tuberofities at the root of the granulata or white-flowered faxifrage are kept in the fhops, under the name of faxifrage feeds; they are diuretic and attenuant; and therefore good in nephritic cafes and obftructions of the menfes and vifcera.

SAXONY, the name of two circles of the German empire, diftinguifhed by the epithets Upper and Lower. The circle of Upper Saxony comprehends the duchy of Saxony, the marquifates of Mifnia, Lufatia, and Brandenburg, and the duchies of Pomerania, Sax Hall, Sax Altemburg, Sax Merfburg, and Sax Naumburg. The circle of Lower Saxony comprehends the duchies of Mecklenburg, Holftein, Lawenburg, Lunenburg, Zell, Bremen, Brunfwic, Hanover, and Magdeburg; the principalities of Verden and Halberftat, and the bifhoprick of Hildefheim.

SAY, or SAYE, in commerce, a kind of ferge or woollen ftuff much ufed abroad for linings, and by the religious for fhirts: with us it is ufed for aprons by feveral forts of artificers, being ufually dyed green.

SCABIOSA, in botany, a plant of the tetrandria monogynia clafs. The common calix confifts of many leaves, and the proper one is double; the receptacle is paleaceous. The fpecies are 25, three of them natives of Britain, *viz.* the fuccifa, or devil's bit; the arvenfis, or common field fcabious; and the columbaria, or leffer field fcabious.

SCAFFOLD, among builders, an affemblage of planks and boards, fuftained by treffels and pieces of wood fixed in the wall; whereon mafons, brick layers, &c. ftand to work in building high walls, &c. and plafterers in plaftering ceilings, &c.

Scaffold alſo denotes a timber-work raiſed in the manner of an amphitheatre, for the more commodious viewing any ſhew or ceremony: it is alſo uſed for a little ſtage, raiſed in ſome public place, whereon to behead criminals.

SCAGEN, a promontory of North Jutland, at the entrance of the Scagerrac ſea, or paſſage out of the ocean into the Baltic ſea: E. lon. 10°, N. lat. 58°.

SCALADO, or SCALADE, in the art of war, a furious aſſault made on the wall or rampart of a city, or other fortified place, by means of ladders, without carrying on works in form to ſecure the men.

SCALE, a mathematical inſtrument, conſiſting of ſeveral lines drawn on wood, braſs, ſilver, &c. and variouſly divided, according to the purpoſes it is intended to ſerve; whence it acquires various denominations, as the plain ſcale, diagonal ſcale, plotting ſcale. See GEOMETRY.

SCALE, in muſick, is a denomination given to the arrangement of the ſix ſyllables invented by Guido Aretine, *ut*, *re*, *mi*, *fa*, *ſol*, *la*, called alſo gammut. See MUSICK.

SCALENE, or SCALENOUS TRIANGLE, *ſcalenum*, in geometry, a triangle whoſe ſides and angles are unqual. See GEOMETRY.

SCALENUS, in anatomy. See ANATOMY, p. 214.

SCALPEL, in ſurgery, a kind of knife uſed in anatomical diſſections and operations in ſurgery.

SCALPER, or SCALPING-IRON, a ſurgeon's inſtrument uſed for ſcraping foul carious bones.

SCALPRA DENTALIA, inſtruments uſed by the ſurgeons to take off thoſe black, livid, or yellow cruſts, which infeſt the teeth, and not only looſen and deſtroy them, but taint the breath.

SCAMMONY, a concreted vegetable juice of a ſpecies of convolvulus, partly of the reſin, and partly of the gum-kind.

The Aleppo ſcammony is of a ſpongy texture, light and friable: it is of a faint diſagreeable ſmell, and its taſte is bitteriſh, very nauſeous, and acrimonious. The Symrna ſcammony is conſiderably hard and heavy, of a black colour, of a much ſtronger ſmell and taſte than the former, otherwiſe it much reſembles it.

Scammony is in great eſteem and frequent uſe. It is an ingredient in many compoſitions of the ſhops; and theſe are preſcribed, with other cathartics, for purging off ſerous humours. It is in general, however, a better purge for robuſt people than for thoſe of more delicate conſtitutions; though, with the correctives with which it is joined, it is given with ſafety and ſucceſs to children.

SCANDALUM MAGNATUM, in law, is a defamatory ſpeech or writing to the injury of a perſon of dignity; for which a writ that bears the ſame name is granted for the recovery of damages.

SCANDEROON, a port-town of Aleppo, in Aſiatick Turky, ſituated on the coaſt of the Leſſer Aſia: E. long. 36°, N. lat. 37° 15′.

SCANDINAVIA, a large country which conſiſted of Sweden, Denmark, and Norway, which were ſometimes under the government of one prince; but is now under the dominion of Sweden and Denmark.

SCANDIX, in botany, a genus of the pentandria digynia claſs. The corolla is of an irregular ſhape; the fruit is ſubulated; the petals are entire; and the floſcules of the diſc are generally males. There are eight ſpecies, two of them natives of Britain, *viz.* the pecten, ſhepherds needle, or venus's comb; and the onthriſcus, or ſmall hemlock ſhervill.

SCANNING, in poetry, the meaſuring of a verſe by feet, in order to ſee whether or no the quantities be duly obſerved.

The term is chiefly uſed in regard to the Greek and Latin verſes. Thus an hexameter verſe is ſcanned, by reſolving it into ſix feet; a pentameter, by reſolving it into five feet, &c.

SCAPE-GOAT, in Jewiſh antiquity, the goat which was ſet at liberty on the great day of expiation.

Spencer is of opinion, that the ſcape-goat was called Azazel, becauſe it was ſent to Azazel, *i. e.* the devil; the reaſons of which ceremony, he takes to be theſe: 1. That the goat, loaded with the ſins of the people, and ſent to Azazel, might denote the miſerable condition of the ſinners. 2. The goat was ſent thus loaded to the dæmons, to ſhew that they were impure, and to deter the people from worſhipping them. 3. That the goat ſent to Azazel ſufficiently expiating the ſins of the Iſraelites, they might the more willingly abſtain from the expiatory ſacrifices of the heathens.

SCAPHOIDES, or os naviculare. See ANATOMY, p. 186.

SCAPULA, in anatomy. See ANATOMY, p. 176.

SCAPULAR, in anatomy, a name given to two pair of arteries and as many veins. See ANATOMY, Part III. and IV.

SCAPULAR, or SCAPULARY, a part of the habit of ſeveral religious orders in the church of Rome, worn over the gown, as a badge of peculiar veneration for the bleſſed Virgin. It conſiſts of two narrow breadths or ſlips of cloth, covering the back and the breaſt, and hanging down to the feet.

The devotees of the ſcapulary celebrate its feſtival on the 16th of July.

SCARABÆUS, the BEETLE, in zoology, a genus of inſects, of the coleoptera order: the antennæ of the beetles are of a clavated figure, and fiſſile logitudinally, and their legs are frequently dentated. There are 87 ſpecies.

SCARBOROUGH, a borough and port town of Yorkſhire, thirty-ſeven miles north-eaſt of York.

It ſends two members to parliament, and is famous for a medicinal ſpring, which has been the ſubject of great conteſts and diſputes among the phyſical people; all allowing it conſiderable virtues, but ſome attributing them to one ingredient, others to another.

SCARIFICATION, in ſurgery, the operation of making ſeveral inciſions in the ſkin by means of lancets, or other inſtruments, particularly the cupping inſtrument. See SURGERY.

SCARLET, a beautiful bright red colour.

In painting in water-colours, minium mixed with a little vermilion produces a good ſcarlet: but if a flower in a print is to be painted of a ſcarlet-colour, the lights as well as the ſhades ſhould be covered with minium, and the ſhaded parts finiſhed with carmine, which will produce an admirable ſcarlet.

SCARP, in fortification, is the the interior talus, or ſlope of the ditch next the place, at the foot of the rampart.

SCARP, in heraldry, the ſcarf which military commanders wear for ornament.

It

It is borne ſomewhat like a battoon ſiniſter, but is broader than it, and is continued out to the edges of the field: whereas the battoon is cut off at each end. See Plate CXLVII. fig. 16.

SCARPANTO, an iſland in the Mediterranean, twenty miles ſouth-weſt of Rhodes: E. long. 27°, N. lat. 36°.

SCARUS, in ichthyology. See LABRUS.

SCAVENGERS, two officers annually choſen in every pariſh in London and its ſuburbs by the church-wardens, conſtables, and other inhabitants, to hire perſons called rakers, with carts, to clean the ſtreets, and carry away the dirt and filth, with the aſhes and duſt from every houſe.

SCENE, in its primary ſenſe, denoted a theatre, or the place where dramatic pieces and other public ſhews were exhibited: for it does not appear that the ancient poets were at all acquainted with the modern way of changing the ſcenes in the different parts of the play, in order to raiſe the idea of the perſons repreſented by the actors being in different places.

The original ſcene for acting of plays was as ſimple as the repreſentations themſelves: it conſiſted only of a plain plot of ground proper for the occaſion, which was in ſome degree ſhaded by the neighbouring trees, whoſe branches were made to meet together, and their vacancies ſupplied with boards, ſticks, and the like; and to complete the ſhelter, theſe were ſometimes covered with ſkins, and ſometimes with only the branches of other trees newly cut down, and full of leaves. Afterwards more artificial ſcenes or ſcenical repreſentations were introduced, and paintings uſed inſtead of the objects themſelves. Scenes were then of three ſorts; tragic, comic, and ſatyric. The tragic ſcene repreſented ſtately magnificent edifices, with decorations of pillars, ſtatues, and other things ſuitable to the palaces of kings: the comic exhibited private houſes with balconies and windows, in imitation of common buildings: and the ſatyric was the repreſentation of groves, mountains, dens, and other appearances; and theſe decorations either turned on pivots, or ſlid along grooves, as thoſe in our theatres.

Scene is alſo a part or diviſion of a dramatic poem. Thus plays are divided into acts, and acts are again ſubdivided into ſcenes; in which ſenſe the ſcene is properly the perſons preſent at, or concerned in, the action on the ſtage at ſuch a time: whenever, therefore, a new actor appears, or an old one diſappears, the action is changed into other hands; and therefore a new ſcene then commences.

SCENIC GAMES, among the ancients, were entertainments exhibited on the ſcena or theatre, including plays, dancing, and other theatrical performances.

SCENOGRAPHY, in perſpective, the repreſentation of a body on a perſpective plane; or, a deſcription thereof in all its dimenſions, ſuch as it appears to the eye. See PERSPECTIVE.

SCEPTER, a kind of royal ſtaff, or battoon, borne by kings on ſolemn occaſions, as an enſign of command and authority.

SCEPTICISM, the doctrines and opinions of the ſceptics, whoſe diſtinguiſhing tenet was that all things are uncertain and incomprehenſible, and that the mind is never to aſſent to any thing, but to remain in perpetual doubt and ſuſpenſe. This doctrine was alſo called pyrrhoniſm, from the name of its author. See PYRRHONIANS.

SCHAFFHOUSE, the capital of the canton of Schaffhouſe, one of the moſt northern cantons of Switzerland: E. long. 8° 40′, N. lat. 47° 42′.

SCHALHOLT, the capital of Iceland, ſubject to Denmark: W. long. 19°, N. lat. 64° 30′.

SCHAMACHIA, a city of Perſia, in the province of Chirvan, ſituated on the weſt ſide of the Caſpian ſea, in E. long. 50′, N. lat. 41°.

SCHELD, a river which riſes in the confines of Picardy, and runs north-eaſt by Cambray, Valenciennes, Tournay, Oudenarde, *&c.* and receiving the Lis at Ghent, runs eaſt by Dendermond, and then north to Antwerp; below which city it divides into two branches; one called the Weſter-Scheld, which ſeparates Flanders from Zeland, and diſcharges itſelf into the ſea near Fluſhing; and the other called the Oſter-ſcheld, which runs by Bergen-op-zoom, and afterwards between the iſlands Beveland and Schowen, and a little below falls into the ſea.

SCHELLING, an iſland of Holland, at the entrance of the Zuyder ſea, between Flie Iſland and Ameland: E. long. 5° 20′, N. lat. 53° 34′.

SCHEMNITZ, capital of the mine towns in Upper Hungary, ſixty miles north-eaſt of Preſburg.

SCHENECTIDA, a fortreſs of New-York, in America, ſituated on Hudſon's River, in the province of Albany, a hundred miles north of New York city.

SCHETLAND, about forty iſlands, which conſtitute part of the country of Orkney, or the Orcades, in Scotland, valuable on account of the herring-fiſhery on their ſhores: ſituated between 1° eaſt and 2° weſt longitude, and between 61° and 62° of north latitude.

SCHIRAS, or SHERAS, a city of Perſia, in the province of Fars, 180 miles ſouth of Iſpahan; reckoned the ſecond city in that kingdom.

SCHISM, a ſeparation, or breaking off from communion with any church; on account of ſome diſagreement in matters of faith or diſcipline.

SCHOENUS, in botany, a genus of the triandria monogynia claſs. The glumæ are paleaceous, and have but one valve; it has no corolla, and but one round ſeed. The ſpecies are 13, five of them natives of Britain.

SCHOLASTIC, ſomething belonging to the ſchools. See SCHOOL.

SCHOLIAST, a grammarian, who writes ſcholia, that is, notes, gloſſes, *&c.* upon ancient authors, who have written in the learned languages. See the next article.

SCHOLIUM, a note, annotation, or remark, occaſionally made on ſome paſſage, propoſition, or the like. This term is much uſed in geometry, and other parts of mathematics, where, after demonſtrating a propoſition, it is cuſtomary to point out how it might be done ſome other way, or to give ſome advice, or precaution, in order to prevent miſtakes, or add ſome particular uſe, or application thereof.

SCHOOL, a public place, wherein the languages, or arts and ſciences are taught. Thus we ſay, grammar-ſchool, writing-ſchool, *&c.*

SCHWALBASH, a town of Germany, in the circle of the Upper Rhine, and in the territory of the Wetteraw, and county of Naſſau, eight miles north of Mentz.

SCHWALBEA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of four ſegments, the

the ſuperior tube being leaſt, and the loweſt largeſt. There is but one ſpecies, a native of America.

SCHWARTSBURG, a town of Germany, in the circle of Upper Saxony, and landgrave of Thuringia, eight miles ſouth eaſt of Gotha.

SCHWARTZENBURG, a town of Germany, in the circle of Franconia, twenty miles eaſt of Wurtſburg.

SCHWATS, a town of Germany, in the county of Tyrol, ſituated on the river Inn, twenty miles north-eaſt of Inſpruc.

SCHWEIDNITZ, a town of Bohemia, in the duchy of Sileſia, capital of a duchy of the ſame name, ſituated twenty ſix miles ſouth of Breſlaw.

SCHWEINFURT, an imperial city of Germany, in the circle of Franconia, and biſhopric of Wurtſburg, ſituated on the river Maine: in E. long. 10° 15′, N. lat. 50° 15′.

SCIÆNA, in ichthyology, a genus belonging to the order of thoracici. The membrane of the gills has ſix rays; the opercula and whole head are ſcaly. There are five ſpecies.

SCIARRI, in natural hiſtory, the matter which runs down in burning torrents from the craters of volcanos, and which probably contains mineral and metallic particles, it being ponderous and hard.

Some of the ſciarri are coarſe, and others fine and poliſhed on the ſurface; ſome of them are black, others grey, others reddiſh, and others of the colour of iron, and many of them have coverings of pure ſulphur over their whole ſurface. They ſeem to be the reſult of many ſorts of minerals melted together.

SCIATICA. See Medicine, p. 128.

SCIENCE, in philoſophy, denotes any doctrine, deduced from ſelf-evident and certain principles, by a regular demonſtration.

SCILLA, the Squill, in botany, a genus of the hexandria monogynia claſs. The corolla conſiſts of ſix open, deciduous petals; and the filaments reſemble threeds. There are eight ſpecies, two of them natives of Britain, *viz.* the bifolia, or vernal ſtar-hyacinth; and the autumnalis, or leſſer autumnal ſtar-hyacinth.

The middle part of the root of the ſcilla maritima, a native of Spain, is only uſed in medicine: the apothecaries cut the root perpendicularly in two; and ſeparating the heart and the outer parts, they expoſe the others to dry. This root is extremely acrid, attenuant, and diſſolvent: it is apt to prove emetic in whatever form it is given; but this may be prevented, by adding a few grains of cinnamon to it: it then becomes a powerful medicine in all obſtructions of the viſcera; it promotes urine and the menſes, and cuts the tough phlegm which almoſt choaks in aſthmas and many other diſorders of the breaſt.

SCILLY, a cluſter of iſlands and rocks, ſituated in the Atlantic ocean: W. long. 7°, N. lat. 50°

SCIO, an iſland of Turky, in the Archipelago, ſituated in E. long. 27°, N. lat. 38° 15′.

SCIOPTIC, a ſphere, or globe of wood, with a circular hole or perforation, wherein a lens is placed. It is ſo fitted, that, like the eye of an animal, it may be turned round every way, to be uſed in making experiments of the darkened room.

SCIRO, an iſland of Turky, in the Archipelago, ſituated E. long. 25°, N. lat. 38° 15′.

SCIRPUS, in botany, a genus of the triandria monogynia claſs. The glumæ are paleaceous and imbricated; it has no corolla, and but one beardleſs ſeed. The ſpecies are 27, ten of which are natives of Britain.

SCIRRHUS, in ſurgery and medicine, a hard tumour of any part of the body, void of pain, ariſing from the inſpiſſation and induration of the fluids contained in a gland; though it may appear in any other part, eſpecially in the fat, being one of the ways wherein an inflammation terminates. See Medicine and Surgery.

SCIURUS, the Squirrel, a genus of quadrupeds belonging to the order of glires. It has two fore-teeth in each jaw, the ſuperior ones ſhaped like wedges, and the inferior ones compreſſed. There are eleven ſpecies. The vulgaris, or common ſquirrel, which is a native of moſt ſouthern parts of Europe, has a pencil of hairs on the top of the ears, four toes on the fore-feet, and five on the hind ones: In the ſummer, it is of a reddiſh colour, with a white belly; in the winter, it is of a blueiſh aſh-colour. The ſquirrel is a very active animal; it feeds upon nuts, berries, &c. which it carries to its mouth by the fore-feet: It lays up its ſuperfluous food in holes; and makes a round neſt of moſs.

SCLAREA, in botany. See Salvia.

SCLAVONIA, a province ſubject to the houſe of Auſtria, and bounded on the north-eaſt by the rivers Drave and Danube, which ſeparate it from Hungary; being about two hundred miles long, and ſixty broad.

It takes its name from the Sclavi, an ancient people of European Scythia; from whom is likewiſe derived the Sclavonic language, which is ſaid to be the moſt extenſive language in the world, except the Arabic; as being the common mother of the Ruſſian, Hungarian, Poliſh, Bulgarian, Carinthian, Bohemian, &c. languages.

SCLERANTHUS, in botany, a genus of the decandria digynia claſs. The calix conſiſts of one leaf; it has no corolla; and the ſeeds are two, incloſed in the calix. There are three ſpecies, two of them natives of Britain, *viz.* the annuus, german knot-graſs, or annual knawel; and the perennis, or perennial knawel.

SCLEROTICA, in anatomy. See Anatomy, p. 289.

SCLEROTICS, medicines proper to harden and conſolidate the fleſh of the parts to which they are applied: as purſlain, houſe-leek, flea-wort, garden night-ſhade, &c.

SCOLOPAX, in ornithology, a genus belonging to the order of grallæ. The beak is cylindrical, obtuſe, and longer than the head; the noſtrils are linear; the face is covered; and the feet have four toes. There are 18 ſpecies.

SCOLOPENDRA, in zoology, a genus of inſects belonging to the order of aptera. The feet are very numerous, being as many on each ſide as there are joints in the body; the antennæ are ſetaceous; there are two jointed pappi; and the body is depreſſed. There are eleven ſpecies.

SCOLYMUS, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is paleaceous; the calix is imbricated and prickly; and it has no pappus. There are two ſpecies, both natives of Italy.

SCOMBER, in ichthyology, a genus belonging to the order of thoracici. The head is ſmooth and compreſſed; and there are ſeven rays in the gill-membrane. The ſpecies are ten.

SCONE,

SCONE, or Scoon, a town of Scotland, near Perth, remarkable for being the place where the kings of Scotland were crowned.

SCOPARIA, in botany, a genus of the tetrandria monogynia claſs. The calix conſiſts of four ſegments; the corolla is rotated, with four ſegments; and the capſule has one cell, and two valves, containing many ſeeds. There are two ſpecies, none of them natives of Britain.

SCOPER, or Scuper-holes, in a ſhip, are holes made through the ſides, cloſe to the deck, to carry off the water that comes from the pump.

SCORBUTUS, the Scurvy. See Medicine, p. 106.

SCORDIUM. See Teucrium.

SCORIA, or dross, among metallurgiſts, is the recrements of metals in fuſion; or, more determinately ſpeaking, is that maſs which is produced by melting metals and ores, and when cold is brittle, and not diſſoluble in water; being properly a kind of glaſs.

SCORIFICATION, in metallurgy, is the art of reducing a body, either entirely, or in part, into ſcoria.

SCORPÆNA, in ichthyology, a genus belonging to the order of thoracici. The head is large and ſharp; the eyes are near each other; there are teeth in the jaws, palate, and fauces; and there are ſeven rays in the membrane of the gill. The ſpecies are three.

SCORPIO, in zoology, a genus of inſects belonging to the order of aptera. It has eight feet, beſides two frontal claws; the eyes are eight in number, three on each ſide of the thorax, and two on the back; it has two claw-ſhaped palpi, a long jointed tail, with a pointed weapon at the extremity; it has likewiſe two combs ſituate betwixt the breaſt and abdomen. There are ſix ſpecies, all natives of ſouthern climates.

Scorpio, in aſtronomy. See Astronomy, p. 487.

SCORPIURUS, in botany, a genus of the diadelphia decandria claſs. The pod is cylindrical, revolute, and intercepted with iſthmi. There are four ſpecies, none of them natives of Britain.

SCORZONERA, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the pappus is plumoſe; and the calix is imbricated with ſcales membranaceous at the edges. There are 11 ſpecies, none of them natives of Britain.

SCOT, a cuſtomary contribution laid upon all ſubjects according to their abilities. Whoever were aſſeſſed to any contribution, though not by equal portions, were ſaid to pay ſcot and lot.

SCOTIA, in architecture, a ſemicircular cavity or channel between the tores, in the baſes of columns. See Architecture.

SCOTISTS, a ſect of ſchool-divines and philoſophers, thus called from their founder J. Duns Scotus, a Scotiſh cordelier, who maintained the immaculate conception of the virgin, or that ſhe was born without original ſin, in oppoſition to Thomas Aquinas and the Thomiſts.

SCOTLAND, excluſive of the iſlands, is ſituated between 1° and 6° W. long. and between 54° 30′ and 58° 30′ N. lat. being about three hundred miles long from north to ſouth and from fifty to one hundred and fifty miles broad, from eaſt to weſt.

Since the union with England, Scotland is divided into thirty-three ſhires, or counties, which all together ſend only thirty knights to parliament, by reaſon the ſhires of Bute and Cathneſs chuſe only alternately, or every other parliament, in their turns; as do thoſe of Cromarty and Nairn, Clackmannan and Kinroſs.

The royal boroughs of Scotland are ſixty-five, but ſo claſſed as to ſend only fifteen burgeſſes to parliament.

New Scotland, *Nova Scotia*, one of the Britiſh colonies in North America, is ſituated between 62° and 72° W. long. and between 43° and 51° N. lat. being bounded by the river of St Laurence on the north and north-weſt; by the bay of St Laurence, and the Atlantic Ocean, on the eaſt; by the ſame ocean, and New-England, on the ſouth; and by Canada, on the weſt.

SCOTOMIA, in medicine, a dizzineſs or ſwimming in the head, wherein the animal ſpirits are ſo whirled about, that external objects ſeem to turn round.

SCRATCH-pans, in the Engliſh ſalt-works, a name given to certain leaden pans, which are uſually made about a foot and half long, a foot broad, and three inches deep, and have a bow, or circular handle of iron, by which they may be drawn out with a hook, when the liquor in the pan is boiling.

The uſe of theſe pans is to receive a calcarious earth, of the nature of that which incruſts our tea kettles, which ſeparates from the water in boiling; this ſubſtance they call ſcratch; and theſe pans, being placed at the corners of the ſalt-pan, where the heat is leaſt violent, catch it as it ſubſides there.

SCREW, one of the ſix mechanical powers. See Mechanics, p. 49.

SCRIBE, an officer among the Jews whoſe buſineſs was to write; of which there were three kinds: the firſt and principal of which were the ſcribes of the law, whoſe office was to write and interpret ſcripture; theſe were in great credit and eſteem among the Jews, and had even the precedency of the prieſts and ſacrificers, and their deciſions were received with almoſt the ſame reſpect as the law of God itſelf: the ſecond kind, properly called ſcribes of the people, were a ſort of magiſtrates: and the third were public notaries, or ſecretaries of the council; which were the leaſt conſiderable.

The ſcribes, among the Romans, wrote out decrees, or acts, and made out authentic copies of them.

SCRIBING, in joinery, *&c.* is a term uſed when one ſide of a piece of ſtuff is to be fitted to another that is irregular.

SCRIPTURE, an appellation given, by way of eminence, to the ſacred and inſpired writings of the Bible. See Bible.

SCROPHULA, in medicine. See Medicine, p. 137, *&c.*

SCROPHULARIA, in botany, a genus of the didynamia angioſpermia claſs. The calix has five ſegments; the corolla is ſomewhat globular; and the capſule has two cells. There are 14 ſpecies, four of them natives of Britain, *viz.* the nodoſa, or knobby-rooted figwort; the aquatica, or water figwort; the ſcorodonia, or balm-leaved figwort; and the vernalis, or yellow figwort.

SCROTUM, in anatomy. See Anatomy, p. 271.

SCRUPI, in natural hiſtory, foſſils, formed into large detached maſſes without cruſts, and compoſed of a variouſly debaſed cryſtalline matter.

SCRUPLE, a weight equal to the third part of a dram, or to twenty grains.

SCRUTINY, a ftrict examination of any thing.

SCULPTURE, an art by which, in taking away, or adding to matter, all forts of figures are formed by the hand, either in the ftone, wood, wax, or metal. In its full latitude it fignifies both the art of working in creux, properly called engraving; and of working in relievo, which is more ftrictly called fculpture.

The firft works in fculpture were with clay, not only in making ftatues, but in forming models; and to this day a fculptor never undertakes any thing confiderable, without forming a model, either in clay or wax. In making figures of thefe materials, they begin and finifh their work with their hands, ufing only three or four pieces of wood, which are roundifh at one end, and at the other flat, with a fort of claws and teeth, which are to fmooth and fcratch the work. For waxen models to every pound of wax add half a pound colophony fome add turpentine, and melt it together with oil of olives; more or lefs of the latter being ufed as they would have the matter harder or fofter: fome alfo add a little vermilion, to give it a colour: this is wrought and moulded with the fingers like clay.

For fculpture in wood, which we properly call carving, the firft thing required is to chufe wood proper for the work the fculptor is to perform If it be any thing large, and that requires a great deal of ftrength and folidity, the hardeft and moft durable wood is to be chofen; and for fmaller works and ornaments, the fofter wood is ufed; but it muft be fuch, however, as is firm and clofe: for a large work, though it be only a fingle figure, it is better to make ufe of feveral pieces of wood, or bits of board, glued together, than of one whole piece, which is more liable to crack; for a thick piece of wood may not be dried to the heart, however it may appear on the outfide.

In fculpture in marble and other ftone, the firft thing to be done is to faw out a block of marble, of the bignefs of the work to be performed; and this being done, the fuperfluities are to be taken off by a ftubbed point and a heavy mallet; thus bringing it near the meafures required, the fculptor reduces it ftill nearer with a finer tool, called a dog's tooth, it having two points, but one not fo fharp as the other. After this he makes ufe of his gradine, which is a flat cutting tool, with three teeth: he then takes off, with a fmooth chiffel, the fcratches the gradine left on the marble, and ufes it with dexterity and delicacy, to give foftnefs and tendernefs to his figure; till at length, taking rafps of different degrees of finenefs, the work is gradually rendered fit for polifhing. To polifh the work, the fculptor ufes pumice-ftone and fmalt; then he goes over it with tripoli; and when he would give it more luftre, rubs it with leather and ftraw afhes. There are feveral other tools ufed by fculptors, adapted to the different parts of the work, and the nature of the ftone they make ufe of. As the models of clay fhrink as they grow dry, whenever fculptors undertake a confiderable piece of work, they only ufe the model for making a mould of plaifter or ftucco, in which is formed a figure of the fame matter, which ferves them thenceforth for a model, and by which they adjuft all their meafures and proportions To proceed the more regularly, on the head of the model they place an immoveable circle divided into degrees, with a moveable rule or index, fixed in the centre of the circle, and divided alfo into equal parts: from the end of the rule hangs a line with a plummet, which ferves to take all the points, to be transferred thence to the block of marble, from whofe top hangs another plummet, like that of the model. But there are fome excellent fculptors, who difapprove of this method; urging, that the fmalleft motion of the model changes their meafures, for which reafon they chufe rather to take all their meafures with the compaffes.

SCUM, properly denotes the impurities which a liquor, by boiling, cafts up to the furface.

The term *fcum* is alfo ufed for what is more properly called the fcoria of metals.

SCURVY, in medicine. See MEDICNE, p. 106.

SCURVY GRASS, in botany. See COCHLEARIA.

SCUTELLARIA, in botany, a genus of the didynamia gymnofpermia clafs. The calix is entire on the edge, is fhut after the flowering, and operculated. The fpecies are 13, two of them natives of Britain, *viz.* the galericulata, or hooded willow-herb; and the minor, or leffer hooded willow-herb.

SCUTIFORME os, in anatomy, the fame with rotula. See ANATOMY p 185.

SCUTIFORMIS CARTILAGO, in anatomy, the fame with the thyroid cartilage See ANATOMY, p. 300.

SCUTTLES, in a fhip, fquare holes cut in the deck, big enough to let in the body of a man, ferving to let people down into any room below upon occafion, or from one deck to another.

SCYTHIA. The northern parts of Europe and Afia were anciently fo called, which afterwards obtained the name of Tartary.

SEA, is frequently ufed for that vaft tract of water encompaffing the whole earth; but is more properly a part or divifion of thefe waters, and is better defined a leffer affemblage of water, which lieth before and wafheth the coafts of fome particular countries from whence it is generally denominated, as the Irifh fea, the Mediterranean fea, the Arabian fea &c

What proportion the fuperficies of the fea bears to that of the land is not precifely known, though it is faid to be fomewhat more than two thirds. As the waters of the earth muft neceffarily rife to the furface thereof, as being fpecifically lighter than the earth, it was neceffary there fhould be large cavities therein for receptacles to contain them; otherwife they would have overfpread all the fuperficies of the earth, and fo have rendered it utterly uninhabitable for terreftrial animals, for the centre of the earth being the common centre of gravity, and the nature of fluids being fuch that they equally yield to equal powers, and the power of attraction being every where equal at equal diftances from the centre, it follows, that the fuperficial parts of the water will every where conform themfelves to an equidiftant fituation from the centre, and confequently will form the furface of a fphere fo far as they extend Hence, that the fea feems higher than the earth or land, refults from the fallacy of vifion, whereby all objects, and the parts of land as well as fea, the farther they are off from us, the higher they appear; the reafon of all which is plain from optics: for it is well known, that the denfer any medium is through which we behold objects, the greater is the refraction, or the more their images appear above the horizontal level; alfo the greater quantity of the medium the rays pafs through, the

the more will they be bent from their first direction; on both these accounts the appearances of things remote, and on the sea, will be somewhat above the horizon, and the more so as they are the more remote.

With regard to the depth or profundity of the sea, Varenius affirms, that it is in some places unfathomable, and in other places very various, being in certain places $\frac{1}{20}$, $\frac{1}{5}$, $\frac{45}{10}$ $1\frac{1}{10}$ $2\frac{2}{10}$ $4\frac{1}{2}$ English miles, in other places deeper, and much less in bays than in oceans. In general, the depths of the sea bear a great analogy to the height of mountains on the land, so far as is hitherto discovered.

There are two principal reasons why the sea doth not increase by means of rivers, *&c.* falling every where into it. The first is, because waters return from the sea by subterranean cavities and aqueducts, through various parts of the earth. Secondly, because the quantity of vapours raised from the sea, and falling on the land, only cause a circulation, but no increase of water. It hath been found by calculation, that in a summer's day there may be raised in vapours, from the Mediterranean sea, 5280000000 tuns of water; and yet this sea receiveth not, from all its nine great rivers, above 1827000000 tuns per day, which is but a third part of what is exhausted in vapours.

With regard to the saltness of the sea-water, it is very rationally judged to arise from great multitudes both of mines and mountains of salt, dispersed here and there in the depths of the sea. Dr Halley supposes that it is probable the greatest part of the sea salt, and of all salt lakes, as the Caspian sea, the Dead sea, the lake of Mexico, and the Titicaca in Peru, is derived from the water of the rivers which they receive; and since this sort of lakes has no exit or discharge, but by the exhalation of vapours; and also since these vapours are entirely fresh, or devoid of such particles; it is certain the saltness of the sea and such lakes must, from time to time increase, and therefore the saltness at this time is greater than at any time heretofore He further adds, that if, by experiments made in different ages, we could find the different quantity of salt which the same quantity of water (taken up in the same place, and in all other the same circumstances) would afford, it would be easy from thence, by rules of proportion, to find the age of the world very nearly, or the time wherein it has been acquiring its present saltness.

With regard to the use of this salt property of sea-water, it is observed, that the saltness of the sea preserves its waters pure and sweet, which otherwise would corrupt and stink like a filthy lake, and consequently that none of myriads of creature that now live therein could then have a being. From thence also the sea-water becomes much heavier, and therefore ships of greater size and quantity may be used thereon. Salt water also doth not freeze so soon as fresh water, whence the seas are more free for navigation. We have lately had published a dissertation, by Dr Russel, concerning the medical uses of sea-water in diseases of the glands, *&c.* wherein the author premises some observations upon the nature of sea-water, considered as impregnated with particles of all the bodies it passes over, such as submarine plants, fish, salts, minerals, *&c.* and saturated with their several effluvia, to enrich it, and keep it from putrefaction; hence this fluid is supposed to contract a soapiness, and the whole collection, being pervaded by the sulphureous steams passing through it, to constitute what we call sea-water, the confessed distinguishing characteristics of which are saltness, bitterness, nitrosity, and unctuosity: whence the author concludes, that it may be justly expected to contribute signally to the improvement of physic. The cases in which our author informs us we are to expect advantage from sea-water, are, 1. In all recent obstructions of the glands of the intestines and mesentery. 2. All recent obstructions of the pulmonary glands, and those of the viscera, which frequently produce consumptions. 3. All recent glandular swellings of the neck, or other parts. 4. Recent tumours of the joints, if they are not suppurated, or become scirrhous, or cancerous, and have not carious bones for their cause. 5. Recent defluctions upon the glands of the eye-lids. 6. All defœdations of the skin, from an erysipelas, to a lepra. 7. Diseases of the glands of the nose, with their usual companion a thickness of the lip. 8. Obstructions of the kidneys, where there is no inflammation, and the stone not large. 9. In recent obstructions of the liver this method will be proper, where it prevents constipations of the belly, and assists other medicines directed in icteric cases. The same remedy is said to be of signal service in the bronchocele; and is likewise recommended for the prevention of those bilious colics that so frequently affect our mariners.

To make sea-water fresh is a thing long and much wanted, for the advantage of navigation and commerce; a method for doing which has been long ago invented by Mr Hauton, and the secret published in the Philos. Transact. It is performed by precipating the water with oil of tartar, and then distilling it. But Mr Appleby's process, which was referred by the lords of the admiralty to the college of physicians, and communicated to the royal society, with some experiments therewith, on Feb. 8, 1753, appears to be more succesful, and is performed thus: Into twenty gallons of sea-water put six ounces of a fixed alkali prepared with quick lime as strong as lapis infernalis, and six ounces of bones calcined to a whiteness, and finely powdered; with a slow fire, draw off, in a common still, fifteen gallons. Mr Appleby conceives that the alkali here employed is the best adapted to prevent the bituminous matter in sea water from rising by heat in distillation.

In the year 1755, a method of procuring any quantity of fresh water at sea was published by Dr Butler; together with a method also of preserving fresh-water entirely pure, sweet, and wholesome, during the longest voyage, and in the warmest climates. The method more expressly recommended by the doctor for making sea-water fresh is to put a measured wine-quart of the strongest soap leys to fifteen gallons of sea-water; which being distilled, he assures us will generally yield twelve gallons of fresh water. The above quantity of soap leys, we are told, will bear a repetition of the same quantity of water four or five times.

This method of Dr Butler was tried, by order of the lords of the admiralty, at the same time with Mr Appleby's: but the latter, being found to be performed with a less quantity of fuel, was preferred.

In order to keep fresh water sweet, Dr Butler directs to take of fine, clear, white pearl-ashes, a quarter of a pound avoirdupoise and put into one hundred gallons of fresh water; observing this proportion to a greater or less

quantity,

quantity, and stop up your cask as usual, till you have occasion to broach it.

For the ebbing and flowing of the sea, see ASTRONOMY, p. 473.

SEAMEN, such as are reserved to serve the king, or other persons, at sea, who may not depart without license, &c. Seamen fighting, quarrelling, or making any disturbance, may be punished by the commissioners of the navy with fine and imprisonment. Registered seamen are exempted from serving in any parish office, &c. and are allowed bounty-money besides their pay. By the law of merchants, the sea-men of a vessel are accountable to the master or commander, and the master to the owners, and the owners to the merchants, for damage sustained either by negligence or otherwise. Where a seaman is hired for a voyage, and he deserts it before it is ended, he shall lose his wages; and in case a ship be lost by a tempest, or in a storm, the seamen lose their wages, as well as the owners their freight.

SEAFORD, a port-town of Sussex, situated on the English channel, seven miles south of Lewes. It sends two members to parliament.

SEAL, a puncheon, or piece of metal, or other matter, usually either round or oval, whereon are engraven the arms, device, &c. of some prince, state, community, magistrate or private person, often with a legend or subscription, the impression whereof in wax serves to make acts, instruments, &c. authentic.

SEAL is also used for the wax or lead, and the impression thereon, affixed to the thing sealed.

SEAL, in Scots law. See LAW, Tit. xii. 25.

SEALER, an officer in chancery appointed by the lord chancellor or keeper of the great seal to seal the writs and instruments there made in his presence.

SEALING, in architecture, the fixing a piece of wood or iron in a wall with plaster, mortar, cement, lead, and other solid binding. For staples, hinges and joints, plaster is very proper.

SEALING-WAX. See WAX.

SEAM or SEME *of corn*, is a measure of eight bushels.

SEAM *of glass*, the quantity of 120 pound, or 24 stones, each five pounds weight. The seam of wood is an horse-load.

SEAR CLOTH, or CERE-CLOTH, in surgery, a form of external remedy somewhat harder than an unguent, yet softer than an emplaster, though it is frequently used both for the one and the other. The sear-cloth is always supposed to have wax in its composition, which distinguishes and even denominates it. In effect, when a liniment or unguent has wax enough in it, it does not differ from a sear-cloth.

SEASIN, in a ship, the name of a rope by which the boat rides by the ship's side when in harbour, &c.

SEASONS, in cosmography, certain portions or quarters of the year, distinguished by the signs which the earth then enters, or by the meridian altitudes of the sun, consequent on which are different temperatures of the air, different works in tillage, &c. The year is divided into four seasons; spring, summer, autumn, and winter. See ASTRONOMY, p. 546.

St. SEBASTIAN, a port-town of Spain, in the province of Biscay, and territory of Guipuscoa: situated in W. long. 1° 50′, N. lat. 43° 35′.

SECALE, RYE, in botany, a genus of the triandria digynia class. The involucrum consists of two leaves, and contains two flowers. There are four species, only one of them, *viz.* the villosum, or wood rye-grass, a native of Britain. For the cerealia, or common rye cultivated in our fields, see AGRICULTURE, p. 61.

SECANT, in geometry, is a line that cuts another, or divides it into two parts.

SECEDERS, a sect of Presbyterians, who dissented from the established church of Scotland in the year 1733. The following circumstance gave rise to this sect. Mess. Erskine, Wilson, Moncrieff, and Fisher, ministers of the church of Scotland, obstinately refused, for several years, to obey the decisions of the General Assembly with regard to the settlement of ministers agreeably to the law of patronage: For this open contempt of authority, the Assembly, after many and repeated admonitions, were at last obliged to eject them from their respective charges. These four clergymen, when they saw matters carried this length, immediately complained of persecution; professed uncommon sanctity and austerity of manners; and cried out that the church was over-run with various errors, such as, a compliance with the law of patronage; the tenderness of the assembly to Professors Simson and Campbell, who were accused of Arian and Arminian heresies; and a multitude of practical deviations from the covenanted reformation of Scotland: They even inveighed against the conduct of the government for their ready admission of malignant and wicked men into places of trust in the army and state; for the loose and unlimited restoration of Charles II. to the throne; for the restoration of prelacy in England, which had been solemnly abjured; for restoring the superstitious Christmas vacance; for the repeal of the penal laws against *witches*, &c. &c. These things, joined to the popular talents of some of the above ministers, alarmed the minds of many well-meaning people, and in a few years procured a numerous train of followers. Elated with this unexpected success, they soon split into two parties. The chief point of contest among the leaders of this sect was concerning the lawfulness of what is called the burgess-oath; and hence the one party have ever since been called *Burghers*, and the other *Antiburghers*. This division naturally weakened their cause, and diminished their number, which still seems to be upon the decline.

SECOMIÆ, in natural history, the name of a genus of fossils, of the class of the septariæ, the characters of which are; that they are bodies of a dusky hue, divided by septa, or partitions of a sparry matter, into several more or less regular portions, of a moderately firm texture, not giving fire with steel, but fermenting with acid menstrua, and easily calcining.

The septariæ of this genus are, of all others, the most common, and are what have been known by the little expressive, or mistaken names of the waxen vein, or ludus helmontii. We have many species of these bodies common among us. Of the whitish or brownish kinds we have thirteen; of the yellowish five; and of the ferrugineous ones, four.

SECOND, in geometry, chronology, &c. the sixtieth part of a prime or minute, whether of a degree, or of an hour.

SECOND, in musick, one of the musical intervals; being only the difference between any sound and the next nearest sound, whether above or below it.

SECON-

SECONDARY, in general, ſomething that acts as ſecond, or in ſubordination to another.

SECRETARY, an officer who by his maſter's orders writes letters, diſpatches, and other inſtruments, which he renders authentic by his ſignet. Of theſe there are ſeveral kinds; as, 1. Secretaries of ſtate, who are officers that have under their management and direction the moſt important affairs of the kingdom, and are obliged conſtantly to attend on the king: they receive and diſpatch whatever comes to their hands, either from the crown, the church, the army, private grants, pardons, diſpenſations, *&c.* as likewiſe petitions to the ſovereign; which when read, are returned to them; all which they diſpatch according to the king's direction. They have authority to commit perſons for treaſon, and other offences againſt the ſtate, as conſervators of the peace at common law, or as juſtices of the peace throughout the kingdom. They are members of the privy-council, which is ſeldom or never held without one of them being preſent: and as to the buſineſs and correſpondence in all parts of this kingdom, it is managed by either of the ſecretaries without any diſtinction: but with reſpect to foreign affairs the buſineſs is divided into two provinces, or departments, the ſouthern and the northern, comprehending all the kingdoms and ſtates that have any intercourſe with Great Britain; each ſecretary receiving all letters and addreſſes from, and making all diſpatches to, the ſeveral princes and ſtates comprehended in his province. Ireland and the Plantations are under the direction of the elder ſecretary, who has the ſouthern province, which alſo comprehends France, Italy, Switzerland, Spain, Portugal, and Turky: the northern province includes the Low Countries, Germany, Denmark, Sweden, Poland, and Muſcovy. Each of the ſecretaries have an apartment in all the royal houſes, both for their own accommodation and their officers; they have alſo a table at the king's charge, or elſe board-wages. The two ſecretaries of ſtate have each two under ſecretaries, and one chief clerk, with an uncertain number of other clerks and tranſlators, all wholly depending on them. To the ſecretaries of ſtate belong the cuſtody of that ſeal properly called the ſignet, and the direction of two other offices, one, called the paper-office, and the other the ſignet-office. 2. Secretary of an embaſſy, a perſon attending an ambaſſador for writing diſpatches relating to the negociation. There is a great difference between the ſecretary of an embaſſy, and the ambaſſador's ſecretary; the laſt being a domeſtic or menial of the ambaſſador, and the firſt a ſervant or miniſter of the prince. 3. The ſecretary of war, an officer of the war-office, who has two chief clerks under him, the laſt of which is the ſecretary's meſſenger. There are alſo ſecretaries in moſt of the other offices.

SECRETION, the ſeparation of ſome fluid from the blood by means of the glands.

In the bodies of animals we obſerve a great number of juices of different natures, *viz.* the blood, lympha, ſaliva, ſtomach liquor, inteſtinal juices, pancreatic juice, bile, urine, *&c.* and the blood is the general ſource of all. See Blood, Lymph, Saliva, *&c.*

SECT, a collective term, comprehending all ſuch as follow the doctrines and opinions of ſome famous divine, philoſopher, *&c.*

SECTION, in general, denotes a part of a divided thing, or the diviſion itſelf. Such, particularly, are the ſubdiviſions of a chapter; called alſo paragraphs and articles: the mark of a ſection is §.

Section, in geometry, denotes a ſide or ſurface appearing of a body or figure cut by another; or the place where lines, planes, *&c.* cut each other.

SECTOR, in geometry, is a part of a circle comprehended between two radii and the arch; or it is a mixed triangle, formed by two radii and the arch of a circle.

Sector is alſo a mathematical inſtrument, of great uſe in finding the proportion between quantities of the ſame kind, as between lines and lines, ſurfaces and ſurfaces, *&c.* for which reaſon the French call it the compaſs of proportion.

The great advantage of the ſector above common ſcale, *&c.* is, that it is adapted to all radii, and all ſcales. For, by the line of chords, ſines, tangents, *&c.* on the ſector, we have lines of chords, ſines, tangents, *&c.* adapted to any radius betwixt the length and breadth of the ſector, when opened.

The ſector is founded on the fourth propoſition of the ſixth book of Euclid, where it is demonſtrated, that ſimilar triangles have their homologous ſides proportional.

SECULAR, ſomething that is temporal; in which ſenſe, the word ſtands oppoſed to eccleſiaſtical: thus we ſay, ſecular power, ſecular juriſdiction, *&c.*

Secular games, *ludi ſeculares*, in antiquity, ſolemn games held among the Romans once in an age. Theſe games laſted three days and as many nights, during which time ſacrifices were performed, theatrical ſhews exhibited, with combats, ſports, *&c.* in the circus. The occaſion of theſe games, according to Valerius Maximus, was to ſtop the progreſs of a plague. The firſt who had them celebrated at Rome was Valerius Publicola, the firſt conſul created after the expulſion of the kings. The ceremonies to be obſerved therein were found preſcribed in one of the books of the Sibyls. At the time of the celebration of the ſecular games, heralds were ſent throughout all the empire, to intimate that every one might come and ſee thoſe ſolemnities which he never yet had ſeen, nor was ever to ſee again. Authors are not agreed as to the number of years wherein theſe games returned, partly becauſe the quantity of an age or ſeculum among the ancients is not known, and partly on other accounts; ſome will have it that they were held every hundred years, and that the ſeculum or age was our century.

SECULARIZATION, the act of converting a regular perſon, place, or benefice, into a ſecular one.

SECUNDINES, in anatomy, the ſeveral coats or membranes wherein the fœtus is wrapped up in the mother's womb, as the chorion and amnios, with the placenta, *&c.* See Midwifery.

SECURIDACA, in botany, a genus of the diadelphia decandria claſs. The calix conſiſts of three leaves; the corolla is papilionaceous, with a vexillum; and the pod is oval, and contains one ſeed. There are two ſpecies, both natives of America.

SECUTORES, in antiquity, a kind of gladiators among the Romans, who fought againſt the retiarii. The ſecutores were armed with a ſword and a buckler, to keep off the net or nooſe of their antagoniſts, and they wore a caſk on their head.

This was also a name given to such gladiators as took the place of those killed in the combat, or who fought the conqueror.

SEDAN, a town of Champagne, in France, situated on the river Maes: in E. long. 4° 45′, N. lat. 49° 46′.

Act of SEDERUNT, in Scots law. See LAW, Tit. i. 4.

SEDIMENT, the settlement or dregs of any thing, or that gross heavy part of a fluid body which, upon resting, sinks to the bottom of the vessel.

SEDITION, in Scots law. See LAW, Tit. xxxiii. 13.

SEDR, or SEDRE, the high priest of the sect of Ali among the Persians. The sedr is appointed by the emperor of Persia, who usually confers the dignity on his nearest relation. The jurisdiction of the sedr extends over all effects destined for pious purposes, over all mosques, hospitals, colleges, sepulchres, and monasteries. He disposes of all ecclesiastical employments, and nominates all the superiors of religious houses. His decisions in matters of religion are received as so many infallible oracles; he judges of all criminal matters in his own house without appeal. His authority is balanced by that of the mudsitehid, or first theologue of the empire.

SEDUM, in botany, a genus of the decandria pentagynia class. The calix consists of five segments, and the corolla of five petals; it has five nectariferous scales at the base of the germen, and five capsules. There are 19 species, nine of them natives of Britain, all orpines and house-leeks.

SEED, in physiology, a substance prepared by nature for the reproduction and conservation of the species both in animals and plants. See GENERATION, and AGRICULTURE, p. 40.

SEEDLINGS, among gardeners, denote such roots of gilliflowers, *&c.* as come from seed sown. Also the young tender shoots of any plants that are newly sown.

SEEDY, in the brandy trade, a term used by the dealers, to denote a fault that is found in several parcels of French brandy, which renders them unsaleable. The French suppose that these brandies obtain the flavour which they express by this name from weeds that grow among the vines from whence the wine of which this brandy is made was pressed.

SEEING, the act of perceiving objects by the organ of sight; or it is the sense we have of external objects by means of the eye. See OPTICS.

SEELING, in the manege. A horse is said to seel when he begins to have white eye brows, that is, when there grows on that part about the breadth of a farthing of white hairs, mixed with those of his natural colour, which is a mark of old age. It is said, that a horse never seels till he is fourteen years old, and always does before he is sixteen years.

SEELING, at sea, is used in the same sense nearly with heeling: when a ship lies down constantly, or steadily on one side, the seamen say she heels; and they call it seeling when she tumbles violently and suddenly, by reason of the sea forsaking her, as they call it, that is, the weaves leaving her for a time in a bowling sea.

SEGEDIN, a city of Upper Hungary, situated on the river Teysse, in E. long. 21°, N. lat. 46° 21′.

SEGESWAEE, a city of Transylvania, situated E. lon. 24°, N. lat. 47° 25′.

SEGMENT *of a circle*, in geometry, that part of the circle contained between a chord and an arch of the same circle.

SEGOVIA, a city of Manila, the largest of the Philippine islands, situated in E. long. 119°, N. lat. 18° 30′.

This is also a name of a city of Spain, in the province of Old Castile, situated W. long. 4° 35′, N. lat. 41°.

SEGRA, a river of Spain, which rising in the north of Catalonia, and running south west, discharges itself into the Ebro, at Miquinenca.

SEGREANT, is the herald's word for a griffon, when drawn in a leaping posture, and displaying his wings as if ready to fly.

SEGUE, in the Italian musick, is often found before *aria*, *alleluja*, *amen*, &c. to shew that those portions or parts are to be sung immediately after the last note of that part over which it is writ; but if these words *si piace*, or *ad libitum*, are joined therewith, it signifies, that these portions may be sung or not, at pleasure.

SEGURA, a town of Portugal, in the province of Beira, ten miles north-west of Alcantara. This is also the name of a town in Spain, in the province of New Castile, and territory of La Mancha, situated among the mountains of Segura; W. long. 2° 50′, N. lat. 38° 25′.

SEJANT, a term used in heraldry, when a lion, or other beast, is drawn, in an escutcheon, sitting like a cat, with his fore feet strait.

SEIZURE, in commerce, an arrest of some merchandize, moveable, or other matter, either in consequence of some law, or of some express order of the sovereign.

SEISIN, in Scots law. See LAW, Tit. x. 16.

SELAGO, in botany, a genus of the didynamia angiospermia class of plants. The calix has five segments; the tube of the corolla is capillary; and there is but one seed. The species are eight, none of them natives of Britain.

SELBY, a town of Yorkshire, situated ten miles south of York.

SELENDERS, in the manege, are chops, or mangy sores, in the bending of a horse's hough, as the malenders are in the knees. See FARRIERY.

SELENITÆ, MOON STONE, in natural history, a class of fossils, naturally and essentially simple; not inflammable nor soluble in water; composed of slender filaments, ranged into fine and even thin flakes, and those disposed into regular figures, in the different genera, approaching to a rhomboide, a hexangular column, or a rectangled inequilateral parallelogram; fissile like the talcs, but that not only horizontally, but perpendicularly also; flexile in a small degree, but not at all elastic; not fermenting with acid menstrua, and readily calcining in the fire.

SELENOGRAPHY, a branch of cosmography, which describes the moon and all the parts and appearances thereof, as geography does those of the earth.

SELEUCIDÆ, in chronology. Æra of the Seleucidæ, or the Syro-macedonian æra, is a computation of time commencing from the establishment of the Seleucidæ, a race of Greek kings, who reigned as successors of Alexander the Great in Syria, as the Ptolomies did in Egypt. This æra we find expressed in the book of the Maccabees, and on a great number of Greek medals struck by the cities of Syria, *&c.* The Rabbins call it the æra of contracts; and the Arabs, Therik dilkarnain, that is, the æra of the two horns. According to the best accounts, the first year

year of this æra falls in the year 311 before Chriſt, being twelve years after Alexander's death.

SELINGENSKOY, a town of Aſiatic Muſcovy, in the province of Siberia, ſituated on the road from Tobolſki to China, on the river Selinga: in E. long. 65°, N. lat. 50°.

SELINUM, in botany, a genus of the pentandria digynia claſs. The fruit is ſomewhat oval, and ſtriated in the middle; the involucrum is reflected; and the petals are equal and cordated. There are four ſpecies, none of them natives of Britain.

SELKIRK, a borough town of Scotland, in the county of Tweedale, ſituated 32 miles ſouth of Edinburgh.

SELLA TURCICA. See ANATOMY, p. 149.

SELTZER WATER, the name of a mineral water of Germany, which ariſes near Neider Seltz, and is now uſed in England and many other countries. We call it ſeltz, or ſaltzer water; and the phyſicians preſcribe it in many caſes, as ſcurvies, ſpaſmodic affections, and in conſumptions; in the laſt caſe, mixing it with aſſes milk.

SEMIOTICA, that part of medicine which conſiders the ſigns or indications of health and diſeaſes, and enables the phyſician to judge what is, was, or will be, the ſtate, degree, order, and effect, of health or ſickneſs.

SEMENDRIA, a town of European Turky, in the province of Servia, ſituated on the Danube, thirty miles ſouth-eaſt of Belgrade.

SEMENTINEÆ FERIÆ, in antiquity, feaſts held annually among the Romans, to obtain of the gods a plentiful harveſt. They were celebrated in the temple of Tellus, where ſolemn ſacrifices were offered to Tellus and Ceres. Theſe feaſts were held about ſeed-time, uſually in the month of January; for Macrobius obſerves, they were moveable feaſts.

SEMI, a word borrowed from the Latin, ſignifying *half*, but only uſed in compoſition with other words, as in the following articles.

SEMI-CIRCLE, in geometry, half a circle, or that figure comprehended between the diameter of a circle and half the circumference.

SEMI-COLON, in grammar, one of the points or ſtops uſed to diſtinguiſh the ſeveral members of ſentences from each other. See PUNCTUATION.

The mark or character of the ſemi-colon is (;) and has its name as being ſomewhat of leſs effect than a colon, or as demanding a ſhorter pauſe.

SEMI-CUPIUM, in medicine, an half bath, wherein the patient is only placed up to the navel.

SEMI-DIAMETER, half the diameter, or a right line drawn from the centre of a circle, or ſphere, to its circumference; being the ſame with what is otherwiſe called the radius.

SEMIFLOSCULUS, in botany, a term uſed to expreſs the flowers of the ſyngeneſia claſs. Theſe ſemifloſculus are petals, hollow in their lower part, but in their upper flat, and continued in the ſhape of a tongue.

SEMIGALIA, the eaſtern diviſion of the duchy of Courland in Poland.

SEMI-INTEROSSEUS INDICIS, in anatomy. See ANATOMY, p. 201.

SEMI LUNAR VALVES, in anatomy. See ANATOMY, p. 178.

SEMI-MEMBRANOSUS, in anatomy. See ANATOMY, p. 208.

SEMI-PELAGIANS, in church-hiſtory, a branch of the Pelagians, ſo called becauſe they pretended to keep a medium between the Pelagians and the orthodox.

SEMI TONE, in muſick, one of the degrees or concinnous intervals of concords.

SEMINAL, ſomething belonging to the ſemen or ſeed.

SEMINARY, a kind of college, or ſchool, where youth are inſtructed in the ceremonies, *&c.* of the ſacred miniſtry, of which there are many abroad; it being ordained by the council of Trent, that there be a ſeminary belonging to each cathedral, under the direction of the biſhop.

SEMINATION, denotes the manner, or act, of ſhedding and diſperſing the ſeeds of plants. See AGRICULTURE, p. 59

SEMI-NERVOSUS, in anatomy. See ANATOMY, p. 208.

SEMIS, in Roman antiquity, the half of an *as*. See AS.

SEMI-SPINALIS, in anatomy. See ANATOMY, p. 218.

SEMPERVIVUM, in botany, a genus of the dodecandria dodecagynia claſs. The calix conſiſts of twelve ſegments; and the corolla of twelve petals; and there are twelve capſules containing many ſeeds.

SENA, in botany. See CASSIA.

Sena leaves are much uſed for their purgative virtue; but are apt to gripe, unleſs given with proper correctives, as coriander, aniſeed, ginger, raiſins, and ſalt of tartar, which are added to the infuſion of the leaves occaſionally.

SENATE, in general, is an aſſembly, or council, of ſenators; that is, of the principal inhabitants of a ſtate, who have a ſhare in the government.

The ſenate of ancient Rome is, of all others, the moſt celebrated: it exerciſed no contentious juriſdiction, but appointed judges, either from among the ſenators or knights, to determine proceſſes: it alſo appointed governors of provinces, and diſpoſed of the revenues of the commonwealth, *&c.* Yet did not the whole ſovereign power reſide in the ſenate, ſince it could not elect magiſtrates, make laws, or decide of war or peace; in all which caſes the ſenate was obliged to conſult the people.

According to Dr Middleton, the conſtant and regular ſupply of the ſenate was from the annual magiſtrates; who, by virtue of their ſeveral offices, acquired a right to ſit and vote in that aſſembly: the uſual gradation of theſe offices being that of quæſtor, tribune of the people, ædile, prætor, and conſul.

The ſenate always met of courſe on the firſt of January, for the inauguration of the new conſuls; and in all months univerſally, there were three days, *viz.* the kalends, nones, and ides, on which it regularly met: but it always met on extraordinary occaſions, when called together by conſul, tribune, or dictator.

SENATOR, in general, denotes a member of ſome ſenate.

SENATUS AUCTORITAS, a vote of the Roman ſenate, drawn up in the ſame form with a decree, but without its force, as having been hindered from paſſing into a decree by ſome of the tribunes of the people.

SENATUS-CONSULTUM a decree of the Roman ſenate, pronounced on ſome queſtion or point of law; which, when paſſed, made a part of the Roman law.

SENECIO, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus is ſimple; and the calix is cylindrical, and caliculated. There are 40 ſpecies, eight of them natives of Britain.

SENEGA, or SENEGAL, a river of Negroland, in Africa, which

which falls into the Atlantic ocean, in 16° N. lat. whence the gum-fenega is imported.

SENESCHAL, a term anciently ufed for fteward or majordomo.

SENS, a town of Champagne, in France, fituated on the river Yonne, fixty miles fouth-eaft of Paris.

SENSATION, in philofophy, the art of perceiving external objects, by means of the fenfes.

SENSE, a faculty of the foul, whereby it perceives external objects, by means of the impreffions they make on certain organs of the body. Thefe organs of fenfation are commonly reckoned five, *viz.* the eye, whereby we fee objects; the ear, which enables us to hear founds; the nofe, by which we receive the ideas of different fmells; the palate, by which we judge of taftes; and the cutis, or fkin, which enables us to feel the different forms, hardnefs, or foftnefs of bodies. See ANATOMY, p 289, 293, 295, 303; OPTICS, *paffim*; and PNEUMATICS.

SENSITIVE PLANT, in botany. See MIMOSA.

SENSORIUM COMMUNE, the fame with the brain. See ANATOMY, p. 285.

SENTENCE, in Scots law. See LAW, Tit. xxxii. 1, *&c.*

SENTENCE, in grammar, a period or fet of words, comprehending fome perfect fenfe or fentiment of the mind.

SENTIMENTS, properly fignifies the feelings excited in our minds by means of the fenfes.

SENTINEL, in military affairs, is a private foldier, placed in fome poft, to watch any approach of the enemy, to prevent furprifes, and to ftop fuch as would pafs without order, or difcovering who they are.

SEPARATION *of Hufband and Wife*, in Scots law. See LAW, Tit. vi. 13.

SEPARATISTS, an appellation given to diffenters, from their fetting up a feparate church from the eftablifhed one.

SEPIA, in zoology, a genus belonging to the order of vermes mollufca. There are eight brachia interfperfed on the interior fide, with little, round, ferrated cups, by the contraction of which the animal lays faft hold of any thing: Befides thefe eight arms, it has two tentacula longer than the arms, and frequently pedunculated. The mouth is fituate in the centre of the arms; and is horny and hooked, like the bill of a hawk. The eyes are below the tentacula, towards the body of the animal. The body is flefhy, and received into a fheath as far as the breaft. There are five fpecies. The officinalis, or cuttle-fifh, emits a black matter when attacked, which hides it from the view of the enemy. The loligo, has a fubulated cylindrical body, with a rhomboidal tail. It is fometimes found on the coafts of the frith of Forth, efpecially after great ftorms. The other fpecies are moftly found in the Mediterranean fea.

SEPS, in zoology. See LACERTA.

SEPTARIÆ, in natural hiftory, a large clafs of foffils, commonly known by the names of ludus Helmontii and waxen veins.

They are defined to be foffils not inflammable, nor foluble in water; of a moderately firm texture, and dufky hue, divided by feveral fepta or thin partitions, and compofed of a fparry matter greatly debafed by earth, not giving fire with fteel, fermenting with acids, and in great part diffolved by them, and calcining in a moderate fire.

Of this clafs there are two diftinct orders of bodies; and under thofe, fix genera. The feptariæ of the firft order are thofe which are ufually found in large maffes, of a fimple uniform conftruction, but divided by large fepta either into larger and more irregular portions, or into fmaller and more equal ones, called talc. The genera of this order are four: 1. Thofe divided by fepta of fpar, called fecomiæ. 2. Thofe divided by fepta of earthy matter, called gaiophragmia. 3. Thofe divided by fepta of the matter of the pyrites, called pyritercia. And, 4. Thofe divided by fepta of fpar, with an admixture of cryftal, called diaugophragmia.

Thofe of the fecond order are fuch as are ufually found in fmaller maffes, of a cruftated ftructure, formed by various incruftations round a central nucleus, and divided by very thin fepta. Of this order are only two genera: 1. Thofe with a fhort roundifh nucleus, inclofed within the body of the mafs; And, 2. Thofe with a long nucleus, ftanding out beyond the ends of the mafs.

SEPTEMBER, the ninth month of the year, confifting of only thirty days: it took its name as being the feventh month, reckoning from March, with which the Romans began their year.

SEPTENTRIO, in aftronomy, a conftellation more ufually called urfa minor.

In cofmography, the term feptentrio denotes the fame with north: and hence, feptentrional is applied to any thing belonging to the north, as feptentrional figns, parallels, *&c.*

SEPTIZON, in Roman antiquity, a celebrated maufoleum, built by Septimus Severus, in the tenth region of the city of Rome: it was fo called from *feptem* and *zona*, by reafon it confifted of feven ftories, each of which was furrounded by a row of columns.

SEPTUAGESIMA, in the calendar, denotes the third Sunday before Lent, or before quadragefima Sunday; fuppofed by fome to take its name from its being about feventy days before Eafter.

SEPTUAGINT, the name given to a Greek verfion of the books of the Old Teftament. See BIBLE.

SEPTUM, in anatomy, an inclofure, or partition, a term applied to feveral parts of the body which ferve to feparate one part from another.

SEPULCHRE, a tomb, or place deftined for the interment of the dead. This term is chiefly ufed in fpeaking of the burying places of the ancients, thofe of the moderns being ufually called tombs.

Sepulchres were held facred and inviolable, and the care taken of them has always been held a religious duty, grounded on the fear of God, and the belief of the foul's immortality. Thofe who have fearched or violated them have been thought odious by all nations, and were always feverely punifhed.

The Egyptians called fepulchres, eternal houfes; in contradiftinction to their ordinary houfes or palaces, which they called inns, on account of their fhort ftay in the one, in comparifon of their long abode in the other.

Regular canons of St SEPULCHRE, a religious order, formerly inftituted at Jerufalem, in honour to the holy fepulchre, or the tomb of Jefus Chrift.

Many of thefe canons were brought from the Holy Land into Europe, particularly into France by Lewis the younger; into Poland, by Jaxa a Polifh gentleman; and into

into Flanders, by the counts thereof; many alſo came into England. This order was however ſuppreſſed by pope Innocent VIII who gave its revenues and effects to that of our Lady of Bethlehem; which alſo becoming extinct, they were beſtowed on the knights of St John of Jeruſalem. But the ſuppreſſion did not take effect in Poland, where they ſtill ſubſiſt, as alſo in ſeveral provinces of Germany. Theſe canons follow the rule of St. Auguſtine.

Knights of the holy SEPULCHRE, a military order, eſtabliſhed in Paleſtine about the year 1114.

The knights of this order in Flanders choſe Philip II. king of Spain, for their maſter in 1558, and afterwards his ſon; but the grand maſter of the order of Malta prevailed on the laſt to reſign: and when afterwards the duke of Nevers aſſumed the ſame quality in France, the ſame grand maſter, by his intereſt and credit, procured a like renunciation of him, and a confirmation of the union of this order to that of Malta.

SEQUELS, in Scots law. See LAW, Tit. xvi. 12.

SEQUESTRATION, in Scots law. See LAW, Tit. xix. 10 and xx. 12

SEQUIN, a gold-coin, ſtruck at Venice, and in ſeveral parts of the grand ſeignor's dominions.

SERAGLIO, a Perſian word, which ſignifies the palace of a prince or lord; in which ſenſe the houſes of the ambaſſadors of England, France, *&c.* are, at Conſtantinople, called their ſeraglios. But the term ſeraglio is uſed by way of eminence, for the palace of the grand ſeignor at Conſtantinople, where he keeps his court, in which his concubines are lodged, and where the youth are trained up for the principal poſts of the empire. It is in form of a triangle, about two miles round, at the end of the promontory Chryſoceras, now called the Seraglio-point: the buildings extend to the top of the hill, and from thence there are gardens that reach to the ſea. The outward appearance is not very beautiful, the architecture being irregular, conſiſting of ſeparate edifices, in the manner of pavilions and domes. The old ſeraglio is the palace where the grand ſeignor's old miſtreſſes are kept.

The ladies of the haram, which is the part allotted to the women, is a collection of young beautiful girls, who, on their admiſſion, are committed to the charge of ſome old lady, and taught muſick, dancing, and other accompliſhments. Theſe frequently play and dance before the grand ſeignor, while others entertain him with their converſation. Beſides theſe ladies, there are a great many black eunuchs, and female ſlaves, in the ſeraglio, whoſe buſineſs it is to guard and wait upon them.

SERAPH, or SERAPHIM, a ſpirit of the higheſt rank in the hierarchy of angels; who are thus called from their being ſuppoſed to be moſt inflamed with divine love, by their nearer and more immediate attendance at the throne of God, and to communicate their fervour to the remoter and inferior orders.

SERAPHIC, burning or inflamed with love or zeal, like a ſeraphim: thus St. Bonaventure is called the ſeraphic doctor, from his abundant zeal and fervour.

SERAPIAS, in botany, a genus of the gynandria diandria claſs. The nectarium is oval and gibbous, with an oval lip. There are five ſpecies, two of them natives of Britain, *viz.* the latifolia, or broad-leaved baſtard hellebore; and the lingifolia, or white-flowered baſtard hellebore.

SERENADE, a kind of concert given in the night, by a lover to his miſtreſs, under her window. Theſe ſometimes only conſiſt of inſtrumental muſick, but at other times voices are added: the muſick and ſong compoſed for theſe occaſions are alſo called ſerenades

SERENE, a title of honour given to ſeveral princes, and to the principal magiſtrates of republics. The king of England, the republic and the doge of Venice, and the children of the king of Spain, are called Moſt Serene: and when the pope, or the ſacred college, write to the emperor, to kings, or the doge, they give them no other title: in like manner the emperor gives no other title to any king, except to the king of France.

SERGE, a woolen ſtuff manufactured in a loom, of which there are various kinds, denominated either from their different qualities, or from the places where they are wrought; the moſt conſiderable of which is the London ſerge, which is highly valued abroad, and of which a manufacture has been for ſome years carried on in France.

SERGEANT, or SERJEANT *at law*, or *of the coif*, is the higheſt degree taken at the common law, as that of doctor is of the civil law; and as theſe are ſuppoſed to be moſt learned and experienced in the practice of the courts, there is one court appointed for them to plead in by themſelves, which is the common-pleas, where the common law of England is moſt ſtrictly obſerved: but they are not reſtrained from pleading in any other court, where the judges, who cannot have that honour till they have taken the degree of ſerjeant at law, call them brothers.

SERGEANT *at arms*, or *mace*, an officer appointed to attend the perſon of the king; to arreſt traitors, and ſuch perſons of quality as offend; and to attend the lord high ſteward when ſitting in judgment on a traitor.

The number of theſe officers is by ſtatute limited to that of thirty.

SERGEANT, in war, is an inferior officer in a company of foot, or troop of dragoons, armed with an halbard, and appointed to ſee diſcipline obſerved, to teach the ſoldiers the exerciſe of their arms, and to order, ſtraiten, and form ranks, files, *&c.*

SERICUM. See SILK.

SERIES, in general, denotes a continued ſucceſſion of things in the ſame order, and having the ſame relation or connection with each other: in this ſenſe we ſay, a ſeries of emperors, kings, biſhops, *&c.*

SERIES, in mathematicks, is a number of terms, whether of numbers or quantities, increaſing or decreaſing in a given proportion. See ALGEBRA, p. 88

SERIPHIUM, in botany, a genus of the ſyngeneſia monogynia claſs. The calix is imbricated; the corolla conſiſts of one irregular petal; and there is a ſingle oblong ſeed below the corolla. There are three ſpecies, none of them natives of Britain.

SEROSITY, in medicine, denotes an over-abundance of ſerum.

SERPA, a town of Portugal, in the province of Alentejo, ſituated on the eaſt-ſide of the river Guadiana, in W. long. 8° 20′, N. lat. 37° 45′.

SERPENS, in aſtronomy. See ASTRONOMY, p. 487.

SERPENT, in zoology. See COLUBER, BOA, ANGUIS, CÆCILIA, AMPHISBÆNA, CROTALUS.

SERPENTARIA, SNAKE-ROOT, the name of a ſpecies of ariſtolochia, or birthwort, with auriculated leaves.

The Virginian ſnake-root obtained its name, as being accounted a ſpecific againſt venomous bites: but whatever truth there may be in that, it is undoubtedly an excellent diuretic, diaphoretic, and alexipharmic medicine, and conſequently good in inflammatory and malignant fevers: it is alſo a powerful antiſeptic, and its doſe is from four to ten or fifteen grains in powder.

SERPENTARIUS, in aſtronomy. See ASTRONOMY, p. 487.

SERPENTINE, in general, denotes any thing that reſembles a ſerpent: hence, the worm or pipe of a ſtill, twiſted in a ſpiral manner, is termed a ſerpentine worm.

SERRATED, in general, ſomething indented, or notched, in the manner of a ſaw; a term much uſed in the deſcription of the leaves of plants.

SERRATULA, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The calix is ſomewhat cylindrical, imbricated, and blunt. There are 16 ſpecies three of them natives of Britain, *viz.* the tinctoria, or ſaw-wort; the alpina, or mountain ſaw-wort; and the arvenſis, or corn ſaw-wort.

SERRATUS, in anatomy, a name given to ſeveral muſcles, from their reſemblance to a ſaw. See ANATOMY, Part II.

SERVANT, a term or relation ſignifying a perſon who owes and pays a limited obedience for a certain time, to another in quality of maſter. See LAW, Tit. vii. 34.

SERVETISTS, a name given to the modern antitrinitarians, from their being ſuppoſed to be the followers of Michael Servetus, who, in the year 1599, was burnt at Geneva, together with his books.

SERVIA, a province of European Turky, bounded by the Save and the Danube, on the north; by Bulgaria, on the eaſt; by Albinia and Macedon, on the ſouth; and by Boſnia and Dalmatia, on the weſt.

SERVICE OF HEIRS, in Scots law. See LAW, Tit. xxvii. 22, *&c.*

SERVITES, a religious order in the thurch of Rome, founded about the year 1233, by ſeven Florentine merchants, who, with the approbation of the biſhop of Florence, renounced the world, and lived together in a religious community on mount Senar, two leagues from that city.

SERVITOR, in the univerſity of Oxford, a ſtudent who attends on another for his maintenance and learning.

SERVITUDE, in Scots law. See LAW, Tit. xvi. 1, *&c.*

SERUM, a thin, tranſparent, ſaltiſh liquor, which makes a conſiderable part in the maſs of blood. See BLOOD.

SESAMOIDA OSSA, in anatomy. See ANATOMY, p. 188.

SESAMUM, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five ſegments; the corolla is campanulated, with five ſegments; the ſtigma is lanceolated; and the capſule has four cells. There are two ſpecies, both natives of India.

The ſeeds of this plant, upon expreſſion, yield a larger quantity of oil than almoſt any other known vegetable; among the Indians, they are uſed as food.

SESELI, in botany, a genus of the pentandria digynia claſs. The umbellæ are globular; the involucrum conſiſts of many leaves; and the fruit is oval and ſtriated. There are 13 ſpecies, only one of them, *viz*, the caruifolia, or meadow-ſaxifrage, a native of Britain.

SESQUI, a Latin particle, ſignifying a whole and a half, which joined with *altera*, *terna*, *quarta*, &c. is much uſed in the Italian muſick to expreſs a kind of ratios, particularly ſeveral pieces of triples.

SESSILE, among botaniſts. See BOTANY, p. 541.

SESSION, in general, denotes each ſitting or aſſembly of a council, *&c.*

SESSION *of parliament*, is the ſeaſon or ſpace from its meeting to its prorogation.

Court of SESSION, in Scots law. See LAW, Tit. iii. 4.

SESTERCE, a ſilver coin in uſe among the Romans.

Some authors make two kinds of ſeſterces, the leſs called ſeſtertius, in the maſculine gender; and the great one, called ſeſtertium, in the neuter; the latter containing a thouſand of the other.

Others will have any ſuch diſtinction of great and little ſeſterces unknown to the Romans: Seſtertius, ſay they, was an adjective, and ſignified *as ſeſtertius*, or two aſſes and an half; and when uſed plurally, as in quinquaginta ſeſtertium, ſeſtertia, it was only by way of abbrevation, and there was always underſtood millia, or thouſand.

SESTOS, a noted fortreſs of European Turky, ſituated at the entrance of the Helleſpont or Dardanelles, twenty-four miles ſouth-weſt of Gallipoli.

SET, or SETS, a term uſed by the farmers and gardeners to expreſs the young plants of the white thorn and other ſhrubs, with which they uſe to raiſe their quick or quick-ſet hedge.

SETHIANS, in church-hiſtory, chriſtian heretics, ſo called becauſe they paid divine worſhip to Seth, whom they looked upon to be Jeſus Chriſt the ſon of God, but who was made by a third divinity, and ſubſtituted in the room of the two families of Abel and Cain, which had been deſtroyed by the deluge. Theſe heretics appeared in Egypt in the ſecond century; and as they were addicted to all ſorts of debauchery, they did not want for followers, and continued in Egypt about two hundred years.

SETON, in ſurgery, a few horſe-hairs, ſmall threads, or large packthread, drawn through the ſkin, chiefly the neck, by means of a large needle or probe, with a view to reſtore or preſerve health by a diſcharge of matter.

SETTE, a veſſel very common in the Mediterranean, with one deck, and a very long and ſharp prow; they carry ſome two maſts, ſome three, without topmaſts. Their yard and ſails are all like the mizen; the leaſt of them are of ſixty tons burden: they ſerve to tranſport cannon and proviſion for ſhips of war and the like.

SETTING, in aſtronomy, the withdrawing a ſtar or planet, or its ſinking below the horizon.

SETTING, in the ſea language. To ſet the land or the ſun by the compaſs, is to obſerve how the land bears on any point of the compaſs, or on what point of the compaſs the ſun is. Alſo when two ſhips ſail in ſight of one another, to mark on what point the chaced bears, is termed ſetting the chace by the compaſs.

SETTING, among ſportſmen, a term uſed to expreſs the manner of taking partridges by means of a dog peculiarly trained to that purpoſe.

SETTLE, a market-town of the weſt riding of Yorkſhire, ſituated forty-five miles weſt of York.

SEVENTH, in muſick, an interval called by the Greeks heptachordon. See MUSICK.

SEVERANCE, in law, the fingling or feparating of two or more joined in one writ.

St. SEVERINO, a city of Naples, in the province of Calabria, fituated eaft longitude 17° 30′, north lat. 39° 16′. This is alfo the name of a town in the pope's territories and marquifate of Ancona, fituated twenty miles fouth-eaft of Loretto.

SEVERN, a river of South Britain, which rifing in Montgomeryfhire, runs eaft till it enters Shropfhire; and having paffed by Shrewfbury turns fouth, and difcharges itfelf into the Briftol channel.

SEVILLE, a city of Spain, capital of the province of Andalufia, fituated on the river Guadalquivir: in W. long. 6°, N. lat. 37° 15′.

SEWER, in the houfehold, an officer who comes in before the meat of a king or noblemen, to place and range it on the table.

SEWER is alfo a paffage or gutter made to carry water into the fea or a river, whereby to preferve the land, *&c.* from inundations and other annoyances.

SEX, fomething in the body which diftinguifhes male from female.

SEXAGENARY, fomething relating to the number fixty: thus fexagenary or fexagefimal arithmetick, is a method of computation proceeding by fixties. See ARITHMETICK, p. 418.

SEXAGESIMA, the fecond Sunday before Lent, or the next to Shrove-Sunday, fo called as being about the fixtieth day before Eafter.

SEXAGESIMALS. See ARITHMETICK, p. 418.

SEXTANS, a fixth part of certain things. The Romans having divided their *as* into twelve ounces, or *unica*, the fixth part of that, or two ounces, was the fextans.

Sextans was alfo a meafure which contained two ounces of liquor, or two cyathi.

SEXTANT, in mathematicks, denotes the fixth part of a circle, or an arch comprehending fixty degrees.

The word fextant is more particularly ufed for an aftronomical inftrument made like a quadrant, excepting that its limb only comprehends fixty degrees.

SEXTILE, the pofition or afpect of two planets when at fixty degrees diftance, or at the diftance of two figns from one another.

SEXTON, a church-officer, whofe bufinefs is to take care of the veffels, veftments, *&c.* belonging to the church, and to attend the minifter, church-wardens, *&c.* at church.

SEXTUPLE, in mufick, denotes a mixed fort of triple which is beaten in double time. See MUSICK.

SEXUALISTÆ, among botanical writers, thofe who have eftablifhed the claffes of plants upon the differences of the fexes and parts of fructification in plants, according to the modern method, as Linnæus, *&c.* See BOTANY, p. 643.

SEYNE, a river of France, which rifing near Dijon, in Burgundy, runs north-weft through Champagne and the ifle of France, through Paris, *&c.* and croffing Normandy falls into the Britifh channel between Havre-de-grace and Honfleur.

SHAD, in ichthyology. See CLUPEA.

SHADOW, in optics, a privation or diminution of light, by the interpofition of any opake body; or it is a plane where the light is either altogether obftructed, or greatly weakened, by the interpofition of fome opake body between it and the luminary.

SHADOW, in painting, an imitation of a real fhadow, effected by gradually heightening and darkening the colours of fuch figures as by their difpofitions cannot receive any direct rays from the luminary that is fuppofed to enlighten the piece.

SHAFT *of a column*, in building, is the body thereof between the bafe and capital: fo called from its ftraightnefs.

SHAFT, in mining, is the pit or hollow entrance into the mine.

SHAFTSBURY, a borough of Dorfetfhire, twenty-five miles north-eaft of Dorchefter; from whence the noble family of Cooper took the title of earl. It fends two members to parliament.

SHAG, in ornithology. See PELICANUS.

SHAGREEN, or CHAGREEN, in commerce, a kind of grained-leather, prepared, as is fuppofed, of the fkin of a fpecies of fqualus, or hound-fifh, called the fhagree, or fhagrain; and much ufed in covering cafes, books, *&c.*

SHAKLES, in a fhip, are the rings with which the ports are fhut faft, by lafhing the port-bar to them. There alfo fhakles put upon bilbow-bolts, for confining the men who have deferved corporal punifhment.

SHAMBLES, among miners, a fort of niches, or landing places, left at fuch diftances in the adits of mines, that the fhovel-men may conveniently throw up the ore from fhamble to fhamble, till it comes to the top of the mine.

SHAMMY, or CHAMOIS-LEATHER, a kind of leather, dreffed either in oil, or tanned; and much efteemed for its foftnefs, pliancy, and being capable of bearing foap without hurt.

The true fhammy is prepared of the fkin of the chamois-goat. See CAPRA.

SHANK, in the menage, that part of a horfe's fore-leg which lies between the knee and the fetlock.

SHANKER, or CHANCRE, in medicine. See MEDICINE, p. 132.

SHANNON, the largeft river in Ireland, which rifing in the county of Leftrim, runs fouthwards, dividing the provinces of Leinfter and Connaught; and then turning fouth-weft, runs through the province of Munfter; and paffing by the city of Limeric, afterwards falls into the weftern or Atlantic ocean.

SHARE *of a plough*, that part which cuts the ground, the extremity forwards being covered with a fharp-pointed iron, called the point of the fhare; and the end of the wood behind, the tail of the fhare. See AGRICULTURE, p. 54.

SHASTER, or SHASTRAM, a facred book, containing the religion of the Banians: it confifts of three tracts; the firft of which contains their moral law; the fecond, the ceremonial; and the third delivers the peculiar obfervances for each tribe of Indians.

SHEAT *of a plough*, a part paffing through the beam, and faftened to the fhare. See AGRICULTURE, p. 54.

SHEATHING, in the fea-language, is the cafing that part of a fhip which is to be under water, with fir board of an inch thick; firft laying hair and tar, mixed together, under the boards, and then nailing them on, in order to prevent worms from eating the fhip's bottom.

SHEATS, in a fhip, are ropes bent to the clews of the fails;

sails; serving, in the lower sails, to haul aft the clews of the sail; but, in top-sails, they serve to haul home the clew of the sail close to the yard-arm.

SHEEP, in zoology. See Ovis.

SHEERING, in the sea-language. When a ship is not steered steadily, they say she sheers, or goes sheering; or when at anchor she goes in and out, by means of the current of the tide, they also say she sheers.

SHEERS, in a ship, are two masts set across at the upper end of each other; a contrivance generally used for setting or taking out the masts of a ship, where there is no hulk to do that office.

SHEFFIELD, a market-town of Yorkshire, 38 miles south-west of York.

SHEFFORD, a market-town of Bedfordshire, seven miles south-west of Bedford.

SHEFFNEL, a market-town of Shropshire, fourteen miles east of Shrewsbury.

SHEIK, an officer in the mosques of Egypt, whose business is the same with that of the imans of Constantinople.

Sheik-bellet, in the Turkish affairs, a magistrate, answering to the mayor of a city with us.

SHIELDS, a port-town of the bishopric of Durham, situated at the mouth of the river Tyne, eight miles east of Newcastle.

SHEKEL, in Jewish antiquity, an ancient coin, worth 2 s. 3 ½ d. sterling.

SHELF, among miners, the same with what they otherwise call fast ground, or fast country; being that part of the internal structure of the earth, which they find lying even, and in an orderly manner, and evidently having retained its primitive form and situation.

SHELL, in natural history, a hard, and as it were stony covering, with which certain animals are defended, and thence called shell-fish.

As to the formation of a shell, it is now generally allowed to be formed by a viscous fluid composed of glue, and several sandy particles of an exquisite fineness, which are transmitted through an infinite number of little channels to the pores where it transpires, condenses, and hardens. When the animal increases in bulk, and the extremity of her body is not sufficiently covered, it continues to evacuate and build in the same manner, finishing or repairing her habitation. This viscous matter is proved, by undeniable experiments, to arise from the body of animals, and not from the shell, as some have imagined.

Fossile Shells, those found buried at great depths in earth, and often immersed in the hardest stones. These fossile shells, as well as those found lying on the sea-shore, make an excellent manure, especially for cold clayey lands; upon which it does not produce nearly so great an effect for the two first years, as it does in the succeeding ones; the reason of which is, that it is not then sufficiently mixed, but in succeeding time it breaks itself into a number of very small particles, and these all become intimately blended with the molecules of earth, and produce their effect more properly.

SHELTIE, a small but strong kind of horse, so called from Shetland, or Zetland, where they are produced.

SHEPPY, an island at the mouth of the river Medway, making part of the county of Kent.

SHERARDIA, in botany, a genus of plants belonging to the tetrandria monogynia class. The corolla consists of one funnel-shaped petal; and there are two seeds having three teeth. The species are three, only one of them, *viz.* the arvensis, or little field-madder, a native of Britain.

SHERBORN, a market-town, twelve miles south-west of York.

SHERBRO, a fort at the mouth of the river Sherbro, in Guinea, formerly in the possession of the English.

SHERENESS, a fort on the north-west part of the isle of Sheppey, situated at the mouth of the river Medway, to defend its entrance.

SHERIFF, an officer in each county of England, nominated by the king, invested with a judicial and ministerial power, and who takes place of every nobleman in the county during the time of his office

Sheriff in Scots law. See Law, Tit. iv. 1.

SHEW-BREAD, among the Hebrews, the name given to those loaves of bread which the priests placed every sabbath day upon the golden table in the sanctuary. The shew-bread consisted of twelve loaves, according to the number of the tribes; these were served up hot on the sabbath day, and at the same time the stale ones which had been exposed all the week were taken away. It was not lawful for any one to eat of those loaves but the priests only: this offering was accompanied with salt and frankincense, which was burnt upon the table at the time they set on fresh loaves.

SHIELD an ancient weapon of defence, in the form of a light buckler, borne on the arm, to turn off lances, darts, *&c.*

Shield, in heraldry, the escutcheon or field on which the bearings of coats of arms are placed. See Escutcheon.

SHILLING an English silver coin. See Money.

SHIP, a general name for all large vessels with sails, fit for navigation on the sea; except galleys, which go with oars, and smack-sails. See Navigation.

A ship is undoubtedly the noblest machine that ever was invented; and consists of so many parts, that it would require a whole volume to describe it minutely. However, we shall endeavour to satisfy the reader the more fully on this head, as it is an article of the utmost importance. And first, to give an idea of the several parts and members of a ship, both external and internal, with their respective names in the sea-language, in Plate CXLVIII. is represented a ship of war of the first rate, with rigging, *&c.* at anchor: Where A is the cat-head; B, the fore-chains; C, the main chains; D, the mizzen-chains; E, the entering part; F, the hawse holes; G, the poop lanterns; H, the chess-tree; I, the head; K, the stern.

L, The bowsprit. 1, 2, Yard and sail. 3, Gammoning. 4, horse. 5, Bob-stay. 6, Sprit-sail sheets. 7, Pendants. 8, Braces and pendants. 9, Halliards. 10, Lifts. 11, Clew-lines. 12, Sprit-sail horses. 13, Bunt-lines. 14, Standing lifts. 15, Sprit sail top. 16, Flying jib boom. 17, Flying jib stay and sail. 18, Halliards. 19, Sheets. 20, Horses

M, The sprit-sail top-mast. 21, Shrouds. 22, 23, Yard and sail. 24, Sheet. 25, Lifts. 26, Braces and pendants. 27, Cap. 28, Jack staff. 29, Truck. 30, Jack flag.

N, The fore-mast. 31, Runner and tackle. 32, 33, Shrouds. 34, Laniards. 35, Stay and laniard. 36, Preventer

Preventer-ſtay and laniard. 37, Woolding the maſt. 38, Yard and ſail. 39, Horſes. 40, Top. 41, Crow-foot. 42, Jeers. 43, Yard tackles. 44, Lifts. 45, Braces and pendants. 46, Sheets. 47, Fore tacks. 48, Bow-lines and bridles. 49, Fore bunt-lines. 50, Fore leech lines. 51, Fore top rops. 52, Puttock ſhrouds.

O, The fore top maſt. 53, 54, Shrouds and laniards. 55, Yard and ſail. 56, Stay and ſail. 57, Runner. 58, Back ſtays. 59, Halliards. 60, Lifts. 61, Braces and pendants. 62, Horſes. 63, Clew-lines. 64, Bow-lines and bridles. 65, Reef-tackles. 66, Sheets. 67, Bunt-lines. 68, Croſs trees. 69, Cap.

P, The fore top gallant maſt. 70, 71, Shrouds and laniards. 72, Yard and ſail. 73, Back ſtays. 74, Stay. 75, Lifts. 76, Clew lines. 77, Braces and pendants. 78, Bow-lines and bridles. 79, Flag ſtaff. 80, Truck. 81, Flag-ſtaff ſtay. 82, Flag of lord high admiral.

Q, The main maſt. 83, 84, Shrouds. 85, Laniards. 86, Runner and tackle. 87, Pendant of the gornet. 88, Guy of ditto. 89, Sail of ditto. 90, Stay. 91, Preventer ſtay. 92, Stay tackle. 93, Woolding the maſt. 94, Jeers. 95, Yard tacles. 96, Lifts. 97, Braces and pendants. 98, Horſes. 99, Sheets. 100, Tacks. 101, Bow-lines and bridles. 102, Crow foot. 103, Top rope. 104, Top. 105, Bunt-lines. 106, Leech-lines. 107, Yard and ſail.

R, The main top maſt. 108, 109, Shrouds and laniards. 110, Yard and ſail. 111, Puttock ſhrouds. 112, Back ſtays. 113, Stay. 114, Stay ſail and ſtay halliards. 115, Runners. 116, Halliards. 117, Lifts. 118, Clew-lines. 119, Braces and pendants. 120, Horſes. 121, Sheets. 122, Bow-lines and bridles. 123, Bunt-lines. 124, Reef tackles. 125, Croſs trees. 126, Cap.

S, The main top gallant maſt. 127, 128, Shrouds and laniards. 129, Yard and ſail. 130, Back ſtays. 131, Stay. 132, Stay ſail and halliards. 133, Lifts. 134, Braces and pendants. 135, Bow-lines and bridles. 136, Clew-lines. 137, Flag ſtaff. 138, Truck. 139, Flag ſtaff ſtay. 140, Flag ſtandard.

T, The mizzen maſt. 141, 142, Shrouds and laniards. 143, Pendants and burtons. 144, Yard and ſail. 145, Crow foot, 146, Sheet. 147, Pendant lines. 148, Peck brails. 149, Stay ſail. 150, Stay. 151, Derric and ſpann. 152, Top. 153, Croſs jack yard. 154, Croſs jack lifts. 155, Croſs jack braces. 156, Croſs jack ſlings.

V, The mizzen top maſt. 157, 158, Shrouds and laniards. 159, Yard and ſail. 160, Back ſtays. 161, Stay. 162, Halliards. 163, Lifts. 164, Braces and pendants. 165, Bow lines and bridles. 166, Sheets. 167, Clew-lines. 168, Stay ſail. 169, Croſs trees. 170, Cap. 171, Flag ſtaff. 172, Flag ſtaff ſtay. 173, Truck. 174, Flag union. 175, Enſign ſtaff. 176, Truck. 177, Enſign. 178, Poop ladder. 179, Bower cable.

Thus we have pointed out the external parts, maſts, rigging, *&c.* an account of all which may be ſeen under their reſpective articles MAST, HULL, ROPE, RUDDER, *&c.*

In Plate CXLIX. is repreſented the ſection of a firſt-rate ſhip of war, ſhewing the inſide thereof: where A is the head; containing, 1, The ſtem. 2, The knee of the head, or cut water. 3, The lower and upper cheek. 4, The tail-board. 5, The figure. 6, The gratings. 7, The brackets. 8, The falſe ſtem. 9, The breaſt hooks. 10, The hauſe hole. 11, The bulk head, forward. 12, The cat-head. 13, The cat-hook. 14, Neceſſary ſeats. 15, The manger within board. 16, The bowſprit.

B, Upon the forecaſtle. 17, The gratings. 18, The partners of the fore maſt. 19, The gun wale. 20, The belfry. 21, The funnel for the ſmoke. 22, The gangway going off the forecaſtle. 23, The forecaſtle guns.

C, In the forecaſtle. 24, The door of the bulk head, forward. 25, The officers cabbins. 26, The ſtair caſe. 27, The fore top ſail ſheet bits. 28, The beams. 29, The car lines.

D, The middle gun-deck forward. 30, The fore-jeer bits. 31, The oven and furnace of copper. 32, The captain's cook-room. 33, The ladder, or way up into the forecaſtle.

E, The lower gun-deck forward. 34, The knees fore and aft. 35, The ſpirketings, or the firſt ſtreak next to each deck; the next under the beams being called clamps. 36, The beams of the middle gun-deck, fore and aft. 37, The car-lines of the middle gun-deck, fore and aft. 38, The fore bits. 39, The after, or main bits. 40, The hatchway to the gunner's and boatſwain's ſtore-rooms. 41, The jeer capſton.

F, The orlap. 42, 43, 44, The gunner's, boatſwain's, and carpenter's ſtore-rooms. 45, The beams of the lower gun-deck. 46, 57, The pillars and the riders, fore and aft. 48, The bulk head of the ſtore-rooms.

G, The hold. 49, 50, 51, The foot-hook rider, the floor-rider, and the ſtandirt, fore and aft. 52, The pillars. 53, The ſtep of the fore maſt. 54, The keelſon, or falſe keel, and dead riſing. 55, The dead wood.

H. A midſhips in the hold. 56, The floor timbers. 57, The keel. 58, The well. 59, The chain pump. 60, The ſtep of the main maſt. 61, 62, Beams and car-lines of the orlop, fore and aft.

I, The orlop a midſhips. 63, The cable tire. 64, The main hatchway.

K, The lower gun-deck a-midſhips. 65, The ladder leading up to the middle gun-deck. 66, The lower tire or ports.

L, The middle gun-deck a-midſhips. 67, The middle tire ports. 68, The entering port. 69, The main jeer bits. 70, Twiſted pillars or ſtantions. 71, The capſton. 72, The gratings. 73, The ladder leading to the upper deck.

M, The upper gun-deck a-midſhips. 74, The main top-ſail ſheet bits. 75, The upper partners of the main maſt. 76, The gallows on which ſpare top-maſts, *&c.* are laid. 77, The fore ſheet blocks. 78, The rennets. 79, The gun wale. 80, The upper gratings. 81, The drift brackets. 82, The piſs dale. 83, The capſton pall.

N, Abaft the main maſt. 84, The gang-way off the quarter-deck. 85, The bulkhead of the coach. 86, The ſtair-caſe down to the middle gun-deck. 87, The beams of

of the upper deck. 88, The gratings about the main-maſt. 89, The coach, or council-chamber. 90, The ſtair-caſe up to the quarter-deck.

O, The quarter-deck. 91, The beams. 92, The carlines. 93, The partners of the mizzen maſt. 94, The gangway up to the poop. 95, The bulk-head of the cuddy.

P, The poop. 96, The trumpeter's cabin. 97, The tafferel.

Q, The captain-lieutenant's cabbin.

R, The cudddy, uſually divided for the maſter and ſecretary's officers.

S, The ſtate-room, out of which is made the bed-chamber, and other conveniences for the commander in chief. 98, The entrance into the gallery. 99, The bulk-head of the great cabbin. 100, The ſtern-lights and after galleries.

T, The ward-room, allotted for the lieutenants and land-officers. 101, The lower gallery. 102, The ſteerage and bulk-head of the ward-room. 103, The whip-ſtaff, commanding the tillar. 104, The after ſtair-caſe down to the lower gun-deck.

V, Several officers cabbins abaft the main-maſt, where the ſoldiers generally keep guard.

W, The gun-room. 105, The tillar commanding the rudder. 106, The rudder. 107, The ſtern-poſt. 108, The tillar-tranſom. 109, The ſeveral tranſoms, *viz.* 1, 2, 3, 4, 5. 110, The gun-room ports, or ſtern-chaſe. 111, The bread-room ſcuttle, out of the gun-room. 112. The main capſton. 112, The main capſton. 113. The pall of the capſton. 114, The partner. 115, The bulk-head of the bread room.

X, The bread-room. Y, The ſteward's room, where all proviſions are weighed and ſerved out. Z, The cock-pit, where are ſubdiviſions for the purſer, the ſurgeon, and his mates.

AA, The platform, or orlop, where proviſion is made for the wounded in time of ſervice. 116, The hold abaft the main-maſt. 117, The ſtep of the mizen maſt. 118. The keelſon, or falſe keel. 119, The dead-wood, or riſing.

Different kinds of SHIPS. All ſhips at firſt were of the ſame form, whatever uſes they were deſigned for; but the various ends of navigation, ſome of which were better anſwered by one form, ſome by another, ſoon gave occaſion to build and fit out ſhips, not only different in bigneſs, but alſo in their conſtruction and rigging: and as trade gave occaſion to the fitting out large fleets of different kinds of merchant-ſhips; ſo ſhips of war became neceſſary, to preſerve them to their juſt proprietors.

SHIPS OF WAR have three maſts, and a bowſprit, and are ſailed with ſquare ſails; the other parts being as deſcribed above, and repreſented in Plate CXLVIII. They are divided into ſeveral orders, called *rates*; that is, their degree or diſtinction as to magnitude, burden, *&c.* The rate is uſually accounted by the length and breadth of the gun-deck, the number of tons, and the number of men and guns the veſſel carries. There are ſix rates, *viz.*

A common firſt-rate man of war has its gun-deck from 159 to 178 feet in length, and from 44 to 51 broad. It contains from 1313 to 2000 tons; has from 706 to 1000 men, and carries from 96 to 100 guns. But one of the moſt conſiderable firſt-rate ſhips was that built at Woolich in 1701; the dimenſions whereof are as follow: The length, 210 feet; number of guns, 110; number of men, 1250; number of tons, 2300; draught of water, 22 feet; the mainſail in length 54 yards, depth 19; main maſt in length 39 feet, in diameter 38 inches; weight of the anchor 82 Cwt. 1 qr 14 lb; cable in length 200 yards, diameter 22 inches.—The expence of building a common firſt rate, with guns, tackling, and rigging is computed at 60,000 *l.* ſterling.

Second rate ſhips have their gun-decks from 153 to 165 feet long, and from 41 to 46 broad: they contain from 1086 to 1482 tons; and carry from 524 to 640 men, and from 84 to 90 guns.

Third rates have their gun-decks from 140 to 150 feet in length, from 37 42 feet broad: they contain from 871 to 1262 tons; carry from 389 to 476 men, and from 64 to 80 guns.

Fourth rates are in length on the gun-decks from 118 to 146 feet, and from 29 to 38 broad: they contain from 448 to 915 tons; carry from 226 to 346 men, and from 48 to 60 guns.

Fifth rates have their gun-decks from 100 to 120 feet long, and from 24 to 31 broad: they contain from 259 to 542 tons; and carry from 145 to 190 men, and from 26 to 44 guns.

Sixth rates have their gun-decks from 87 to 95 feet long, and from 22 to 25 broad: they contain from 152 to 256 tons; carry from 40 to 110 men, and from 16 to 24 guns.

It is to be obſerved, that the new-built ſhips are much larger, as well as better, than the old ones of the ſame rate; whence the double numbers all along; the larger of which expreſs the proportions of the new built ſhips, as the leſs thoſe of the old ones.

MERCHANT-SHIPS are eſtimated by their burden; that is, by the number of tons they bear, each ton reckoned at 2000 lb weight; this eſtimate being made by gauging the hold, which is the proper place of loading.

Beſides thoſe mentioned above, there are other forms: as, 1. The bilander, (Plate CXLIX. fig. 2.) which has rigging and ſails not unlike a hoy, only broader and flatter: bilanders are ſeldom above twenty-four tons, and can lie nearer the wind than a veſſel with croſs-ſails can do. 2. Bomb-veſſels, (*ibid.* fig. 3.) have ſometimes three maſts, and ſquare ſails, as repreſented; but they are alſo frequently ketch-faſhion, with one maſt and a mizen. 3. Brigantines (*ibid.* fig. 4.) are now diſuſed; but had two maſts, and ſquare ſails. 4. Hag-boats (*ibid.* fig. 5.) are maſted and ſailed ſhip-faſhion, but are built in the form of the Dutch fly-boat. 5. Hoys (*ibid.* fig. 6.) are fitted with one maſt and a ſprit-ſail; whoſe yards ſtand fore and aft like a mizen, ſo that it can lie near the wind. 6. Hulks (*ibid.* fig. 7.) are generally old ſhips cut down to the gun-deck, and fitted with a large wheel, for men to go in when careening: it has alſo ſeveral capſtons fixed on its deck, for ſetting ſhips maſts. 7. Ketches (*ibid* fig. 8.) are fitted with two maſts; and their main-ſail and top-ſail ſtand ſquare as thoſe of ſhips do, but their fore-ſail and jibbs as thoſe of hoys do. 8. Lighters (*ibid.* fig. 9.) are veſſels made uſe of for laying down or ſhifting the moorings, for bringing aſhore or carrying on broad ſhips cables, anchors, *&c.* 9. Pinks (*ibid.* fig. 10.)

A First Rate Ship of War,

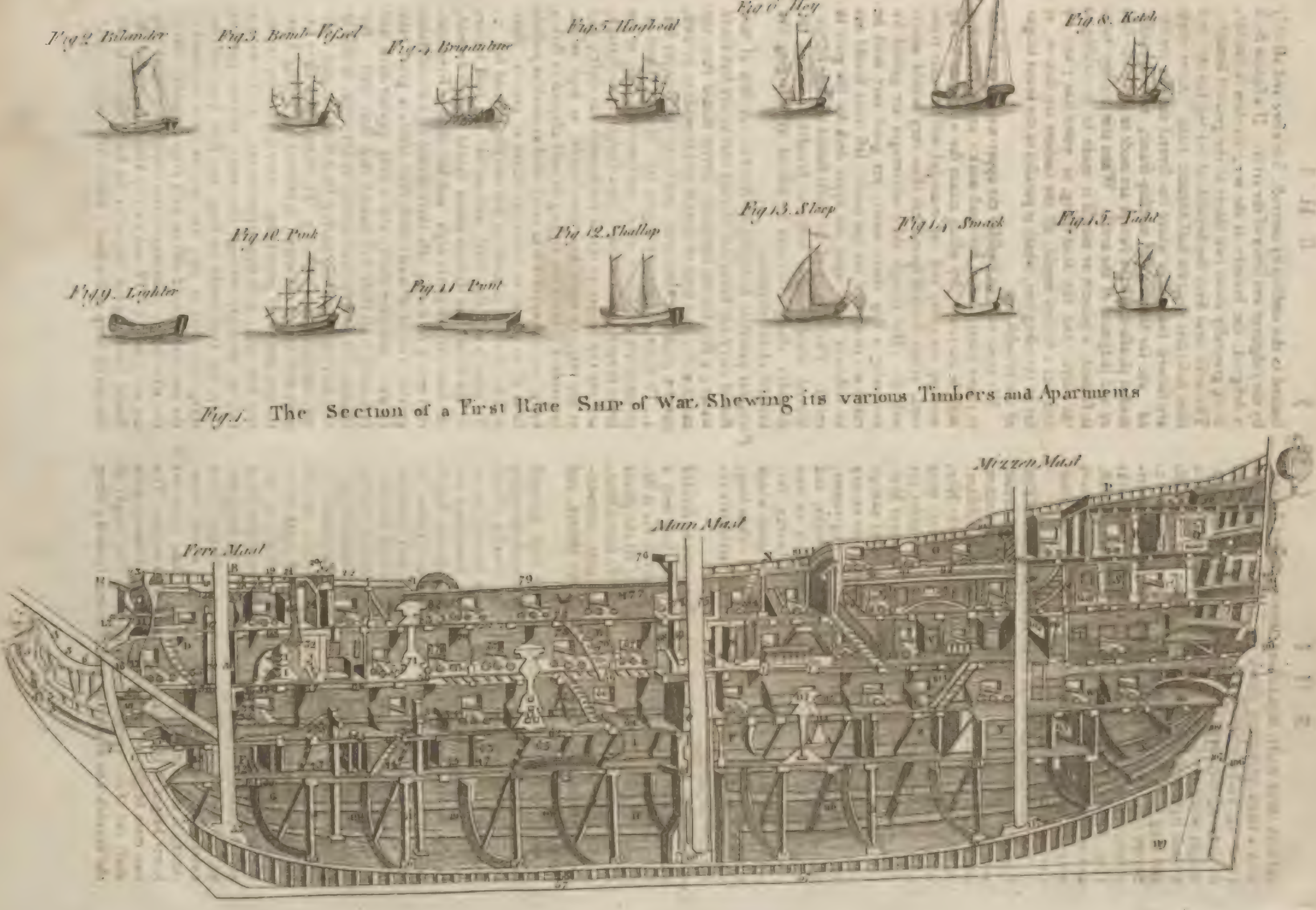


Fig. 2. Bilander — Fig. 3. Bomb-Vessel — Fig. 4. Brigantine — Fig. 5. Hagboat — Fig. 6. Hoy — Fig. 7. Hulk — Fig. 8. Ketch

Fig. 9. Lighter — Fig. 10. Pink — Fig. 11. Punt — Fig. 12. Shallop — Fig. 13. Sloop — Fig. 14. Smack — Fig. 15. Yacht

Fig. 1. The Section of a First Rate Ship of War, Shewing its various Timbers and Apartments

ſail with three maſts, ſhip-faſhion; but are round ſterned, with a ſmall projection above the rudder. 10. Punts (*ibid.* fig. 11.) are built ſquare, and uſed about the docks for fetching clay and other ſervices as the maſter ſhipwright wants them for. 11. Shallop (*ibid.* fig. 12.) is a ſmall light veſſel, with only a ſmall main and fore maſt, and lugg ſails, to haul up and let down on occaſion. 12. Sloops (*ibid.* fig 13.) have only one maſt, with ſhoulder-of-mutton, ſquare, lugg, and ſmack ſails. 13. Smacks (*ibid.* fig. 14.) are tranſporting veſſels, with one maſt, and an half ſprit-ſail. 14. Yachts (*ibid.* fig. 15.) have only one maſt, with an half ſprit or ſmack ſail, and ſometimes ketch-faſhion.

The moſt celebrated ſhips of antiquity are thoſe of Ptolemy Philopater. One was 280 cubits long, 38 broad, and 48 high, each cubit being 1 Engliſh foot $5\frac{1}{2}$ inches, and carried 400 rowers, 400 ſailors and 3000 ſoldiers. Another which the ſame prince made to ſail on the Nile, we are told, was half a ſtadium long. Yet theſe were nothing in compariſon with Hiero's ſhip, built under the direction of Archimedes; on the ſtructure whereof Moſchion wrote a whole volume. There was wood enough employed in it to make 50 galleys: it had all the variety of apartments of a palace; ſuch as banqueting-rooms, galleries, gardens, fiſh-ponds, ſtables, mills, baths, and a temple to Venus. It was encompaſſed with an iron rampart, eight towers, with walls and bulwarks, furniſhed with machines of war; particularly one, which threw a ſtone of 300 pounds, or a dart 12 cubits long, the ſpace of half a mile, with many other particulars related by Athenæus.

Conſtruction of SHIPS. Naval architecture may be divided into three principal parts: 1. To give the ſhip ſuch a figure and proportion as may ſuit the ſervice ſhe is deſigned for. 2. To find the true form of all the pieces of timber that ſhall be neceſſary to compoſe ſuch a ſolid. 3. To make proper accommodations for guns, ammunition, proviſions, and apartments for all the officers, and likewiſe room for the cargo.

As to the firſt part, the length of the keel, greateſt breadth, depth in the hold, height between decks and in the waſte, and ſometimes the height and breadth of the wing-tranſom, in ſhips for the merchants ſervice, are agreed on by contract; and from theſe dimenſions the builder forms a draught ſuitable to the trade the ſhip is deſigned for. The firſt thing that is generally done, is to lay down the keel, the ſtem, and ſtern-poſt, upon the ſheer-plane, or plane ſuppoſed to paſs through the middle line of the keel, ſtem, and ſtern-poſt, cutting the ſhip in two halves lengthwiſe. They next determine the proper ſtation of the mid-ſhip timber, where a perpendicular is erected, and is generally about two thirds of the keel before the ſtern-poſt: on this line the given depth of the hold is ſet off, from the upper-ſide of the keel; to obtain which point, the thickneſs of all the timber and plank muſt be added to the height agreed on. This being fixed, will enable us to determine the upper-height of the extreme or greateſt breadth of the ſhip; which, ſometimes, is that very point; and from the ſame place the lower height of the breadth muſt be determined. The two main heights of the breadth-lines, which nearly unite abaft and afore, are next determined. The height of the breadth-line of the top-timber is next formed; being limited in the midſhip by contract, but afore and aft only by the judgment and fancy of the artiſt. If a ſquare ſtern is deſigned, the breadth at the wing-tranſom is limited, being generally about two thirds of the greateſt breadth. The artiſt next fixes the breadth of the top-timber, and then deſcribes the two half-breadth lines. After theſe are formed the places where the ſeveral timbers are fixed: and for forming the midſhip-frame, radii are aſſumed at pleaſure, till the ſweeps are made to pleaſe the fancy and judgment of the artiſt. When this midſhip-frame is formed, a pattern or mould is made to fit exactly to the curve, and the dead-riſing, or water-line; and by this and a hollow mould, all the timbers are formed, as far as the riſing-line, which is parallel to the lower height of the breadth-line.

We come next to conſider the upper-works, or all that is above water, called the dead-work: and here the ſhip muſt be narrower, by which means ſhe will ſtrain leſs by working the guns, and the main-ſail will be eaſier trimmed, as the ſhrouds ſpread leſs than they would otherwiſe do. But though theſe advantages are gained by narrowing a ſhip above water, yet great care muſt be taken not to narrow her too much, leſt there ſhould not be ſufficient room upon the upper deck for the guns to recoil. The ſecurity of the maſts ſhould likewiſe be conſidered, which require ſufficient breadth to ſpread the ſhrouds; though this may be aſſiſted by enlarging the breadth of the channels.

Principal qualities belonging to SHIPS. A ſhip of war ſhould carry her lower tire of guns four or five feet above water; a ſhip for the merchants ſervice ſhould ſtow the cargo well; and both of them ſhould be made to go well, carry a good ſail, ſteer well, and lie-to eaſily in the ſea. 1. To make a ſhip carry a good ſail, Mr Du Hamel recommends a flat floor-timber, and ſomewhat long, or the lower futtock pretty round; alſo a ſtraight upper futtock, and the top timber to throw the breadth out aloft; and at any rate, to carry her main-breadth as high as the lower-deck; for if the rigging be well adapted to ſuch a body, and the upper-works heightened as much as poſſible ſo as all to concur to lower the centre of gravity, there will be no room to doubt of her carrying a good ſail. 2. To make a ſhip ſteer well, and anſwer the leaſt motion of the helm, the faſhion-pieces ſhould be well formed, the tuck carried pretty high, and the midſhip-frame carried pretty forward; alſo there ſhould be a conſiderable greater draught of water abaft than afore, a great rake forward, and none abaft, and a ſnug quarter-deck and fore-caſtle: all theſe will make a ſhip ſteer well. But to make her feel the leaſt motion of her helm, it will be neceſſary to regard her maſts; for a ſhip that goes well, will certainly ſteer well. 3. To make a ſhip carry her guns well out of the water, is effected by a long floor-timber, and not of great riſing, a very full midſhip-frame, and low tuck, with light upper-works. 4. To make a ſhip go ſmoothly through the water, without pitching hard, her keel ſhould be long, her floor long and not riſing high afore or aft; the area or ſpace contained in the fore-body ſhould alſo be duly proportioned to that of the after-body, according to the reſpective weights they are to carry. 5. To make a ſhip keep a good wind, ſhe ſhould have a good length by the keel, not too broad, but pretty deep in the hold; which will make her floor-timber

timber short, and rising great. As such a ship will meet with great resistance in the water going over the broad side, and but little when going a-head, she will not fall much to the leeward. Now some ship-builders imagine, that it is impossible to make a ship carry her guns well, carry a good sail, and be a prime sailor at the same time; because it requires a very full bottom to gain the two first qualities, and a sharp-bottomed ship best answers the latter: but when it is considered, that a full ship will carry a great deal more sail than a sharp one, a good artist may so form the body as to have all these three good qualities united, and likewise steer well; for which purpose, Mr Du Hamel recommends somewhat more in length than has been commonly practised.

SHIPTON, a market-town, twenty-four miles south-east of Worcester.

SHIRE, in geography, signifies the same as county; being originally derived from a Saxon word which signifies *to divide*.

SHIVERS, in the sea language, names given to the little rollers or round wheels of pulleys.

SHOAD, among miners, denotes a train of metalline stones, serving to direct them in the discovery of mines.

SHOAL, in the sea-language, denotes a place where the water is shallow.

SHOE, a covering for the foot, usually made of leather, by the company of cordwainers.

SHOE *for an anchor*, in a ship, the place for the anchor to rest, and fitted to receive the stock, *&c.* so as to prevent the sheets, tacks, and other running rigging, from galling, or being entangled with the flooks.

SHORE, a place washed by the sea, or by some large river, Count Marsigli divides the sea-shore into three portions: the first of which is that tract of land which the sea just reaches in storms and high tides, but which it never covers; the second part of the shore, is that which is covered in high tides and storms, but is dry at other times; and the third is the descent from this, which is always covered with water.

SHOREHAM, a borough and port town of Sussex, twenty-five miles east of Chichester. It sends two members to parliament.

SHORT-HAND WRITING.

AS STENOGRAPHY, or the Art of SHORT-HAND WRITING, when well understood, and rendered familiar by practice, is attended with many valuable consequences, we shall, without attempting to enumerate the infinite variety of systems that have been published, furnish our readers with that system which appears to be the most easy, beautiful, and expeditious, and at the same time calculated for general use.

PART I.

THE Alphabet being the foundation upon which the perfection of the art depends, great care must be taken to establish it in the best manner. All the simple sounds must be represented by the shortest marks possible. We must, therefore, not only reject the complex marks established by custom in our common alphabet, but also those letters themselves whose sounds may always be signified by others; and simple marks must be provided for such simple sounds as are by custom represented by two letters a-piece: for which reason, it is necessary to examine the alphabet, and to fix the number of characters, before we proceed to investigate the marks which are to represent them. First, then, let us consider what number of consonants may be requisite. We shall afterwards treat of the vowels, which are to be represented by points or dotts.

The consonants, according to our usual reckoning, are, *b, c, d, f, g, h, j, k, l, m, n, p, q, r, s, t, v, w, x, y, z.* But custom differs from nature in inserting the letters *c, q, w, x, y,* and in omitting *sh, zh, th, dh, ch:* for *c* having always either the sound of *k* or *s*, *q* that of *koo*, *w* of *oo*, *x* of *ks*, and *y* of *i;* in an alphabet according to nature none of these could have found a place; and *sh, zh, th, dh, ch,* representing single consonantal sounds as much as *ph* does, whose power is that of *f*, ought all to have been denoted by single characters, as most of them are in the alphabets of other languages.

The natural alphabet, therefore, might have been taken for our short-hand one, rejecting the superfluous letters *c, q, w, x, y,* and inserting in their stead *sh, zh, th, dh, ch:* but having some marks that were not conveniently applicable to any other purpose, and it being a compendium to represent two letters by a single character, as in the *q* and *x*, and some ease to the reader to retain at the beginning of words the *w* and *y*, to which he has been long accustomed; we shall, totally rejecting the *c*, appropriate distinct marks to denote *q, x, w, y,* when they are initial letters; not scrupling however, in other situations, if it prove more convenient, to denote them by *k, ks, oo* and *i*, respectively.

Zh never had any particular mark to signify it by; and custom has, for a long period of time, ceased to make any distinction in writing between the *th* and *dh:* and as the adherence to nature in making nice distinctions, where custom has not, would be so far, in this case, from serving any valuable purpose of short-hand, that it would rather, on the contrary, render the learning to write and read it more difficult, we have, in pursuance of our plan, complied with custom in dropping the *zh*, and marking the sounds both of *th* and *dh* by the same character.

S and *z* bear the same relation to each other, that the *th* and *dh* do; and the sound of *z* in our customary way of writing is very frequently expressed by *s*, except in cases when it occurs at the beginning of words, which happen but very seldom. These considerations induce us to secure the great convenience which arises from signifying both *s* and

and z by one mark. And, for a like reason, we ſhall make one mark repreſentative both of *f* and *v*. The ſenſe of the place will eaſily diſcover, to a man tolerably acquainted with Engliſh, which of the two it muſt there repreſent; and the reader will be taught, when the characters are appropriated to the conſonants, how, in moſt caſes, entirely to remove any little ambiguity that poſſibly might ariſe from it. Our alphabet will then conſiſt of the following conſonants, *viz.* *b*, *d*, [*f v*] *g*, *h*, *j*, *k*, *l*, *m*, *n*, *p*, *q*, *r*, [*s z.*] *t*, *w*, *x*, *y*, *ch*, *ſh*, *th*.

The number of our conſonants being thus ſettled, and the reaſons for fixing upon that number being given; the next buſineſs muſt be, to invent as many ſimple marks, eaſy to be made and diſtinguiſhed from each other, as are neceſſarily required to repreſent them They muſt be ſimple, if brevity be conſulted; and they muſt be eaſily diſtinguiſhable from each other, to avoid the confuſion ariſing from miſtaking one letter for another.

Nature affords us four ſtraight lines, ſufficiently diſtinguiſhable from each other, by their horizontal, perpendicular, and inclined poſition, to execute our deſign by; (ſee Plate CL. No 1.) but it affords only theſe four. In this ſcarcity of ſtraight lines, recourſe muſt be had to curved ones for a further ſupply. The four ſtraight lines bent in the following manner, that is to ſay, the horizontal upwards and downwards, the perpendicular and inclined ones to the right and left, will each of them furniſh two more very good ſhort-hand marks; *ibid* N° 2.

The number of marks thus increaſed ſtill falls ſhort of ſupplying our wants. The beſt expedient to remedy this defect, is the addition of a little twirl to the beginning of as many of the foregoing marks as there will be occaſion for. It is eaſily and quickly made, when the marks are formed ſeparately; and the twirled marks are joined to preceding ones in as little time as the plain ones. N° 3. 4.

A ſufficient number of proper marks being thus obtained, it remains that each of them be appropriated to the particular conſonant which it is to repreſent. Eaſy as this may ſeem, it is, however, a point of the greateſt nicety; and demands, not only the moſt careful conſideration, but alſo the moſt aſſiduous application to continual trials and alterations. A ſhort-hand alphabet may have all its characters ſimple, eaſy, and diſtinguiſhable, when ſeparately formed; and yet not be a perfect one. To merit that title, it is further requiſite, that they be ſo contrived and adjuſted, that all the conſonants occurring in any word may be eaſily, beautifully, and interlineally joined together, betwixt two given parallel lines, without taking off the pen. Experience has taught quick writers even of long-hand, that the joining all the letters of a word together contributes much to diſpatch, though they are obliged to make little additional ſtrokes for that purpoſe.

Let us then conſider, to what particular conſonant each of our marks is to be appropriated; and begin with the four ſtraight lines.

The firſt of theſe lines, *viz.* the horizontal, as it goes ſtraight forwards, can never exceed the limits of the given parallels, whatever part it begins from; and therefore, in a ſhort-hand formed for lineal beauty, it muſt be appropriated to that conſonant, which, of all others, occurs the oftenest, and challenges, of right, the moſt commodious character for beauty and diſpatch. Now the conſonant that occurs the moſt frequently in our language (and perhaps in moſt others) is the *s*; which has a property, peculiar to itſelf, of mixing with other conſonants before or after it, without the intervention of a vowel. The plural number of moſt of our ſubſtantives, and the third perſon ſingular of our verbs, are formed by it; which muſt occaſion the moſt frequent repetition of it; ſo that, being undoubtedly the commoneſt of all our conſonants, it muſt of neceſſity be denoted by the horizontal ſtraight line.

The ſecond ſtraight line, or perpendicular, is alſo a very eaſy mark, and, ſeparately made, even preferable to the other; but as, in union with others, it may endanger our deſcending below the line, it muſt therefore be allotted to a common conſonant, and one alſo that will the leaſt occaſion us to run that hazard. Now the *t* has, in fact, theſe and other properties that entitle it to this perpendicular ſtraight line.

The third ſtraight line, by its peculiar inclination, is adapted to a very eaſy and convenient joining with other characters; becauſe our cuſtomary method of inclining the letters, in common writing, teaches us to form it with equal readineſs upwards or downwards, as the keeping the previous or following marks within the preſcribed parallels ſhall require. The conſonant, therefore, that claims this character, is the *r*, which makes ſo many of our double conſonants (as we call them) and admits any other ſingle one to follow it immediately. The ſtraight line then which ſlopes downwards to the left, is *r*

The laſt line of the four ſtraight ones, by its direction or ſlope to the right, is aukward to make (and therefore never is made) upwards, like the foregoing, to which it unites the moſt readily. Its properties, upon trial, ſuit beſt with the occurrency of the conſonants *f* or *v*.

The twirl being formed to the left hand in theſe four marks, (N° 5.) diſqualifies them from an eaſy junction with any preceding conſonant. They muſt then, for that reaſon, be aſſigned to ſuch conſonants as occur the ſeldomeſt in the middle or at the end of words, or to ſuch as may be otherwiſe ſignified when they do occur in ſuch ſituations. Now the *h*, or *j*, are rarely to be met with in the middle of words, unleſs immediately preceded by ſome prepoſition, as *inhabit*, *reject*, &c. in which caſe, the reader will be taught hereafter how to write them: and when *x* and *y* are not at the beginning of words, they may be expreſſed by *ks*, and the dot for the vowel *i* reſpectively. The properties of theſe four letters agreeing well with thoſe of the four marks, luckily point out a uſe for four eaſy characters, which could not however have been conveniently allotted to any other conſonants; and the following appropriation of them, upon trial, is found to be the moſt commodious, *viz.* the firſt for *h*, the ſecond for *j*, the third for *x*, and the fourth for *y*.

K is a very common conſonant; and the frequency of its occurrence will be much increaſed by its being made ſo often repreſentative of the rejected *c*, and *ks* of *x*: a character, therefore, which is not only eaſy to be made, but which will alſo join readily with all the reſt, without running either above or below the line, muſt be appropriated to it. The horizontal ſtraight line, with the additional twirl, will, for theſe reaſons, be the moſt commodious. But as the diſtinguiſhing the *k* and *q*, at the beginning of words eſpecially, will, in ſome degree, facilitate the reading; the horizontal ſtraight line with the twirl above is made for *k*, with the twirl below for *q*, when they are initial letters.

In all other cafes, thefe two marks are ufed promifcuoufly for *k* or *q*, whenever a more eafy, beautiful junction may by that means be obtained; the one joining evidently much better with the characters which are written upwards, the other with thofe downwards.

But to give a detail of all the reafons for the appropriation of each particular mark to each confonant, would prove tedious. Moft of them cannot efcape the obfervation of an attentive practifer as he goes along. It will, therefore, be fufficient to affure the reader, that no pains was fpared to adjuft the alphabet to the utmoft nicety, by fuch an exact attention to continual trials and amendments as was neceffary to afcertain the preference of the difpofition of the characters in it to any other that could poffibly have been pitched upon amongft that almoft infinite variety into which they might have been thrown; and that, if he has the curiofity to make the experiment, he will find, that no change can be made in the allotment of the marks, but what will be attended with confiderable difadvantage.

Two marks are alloted to *b*; (fee Table of the Alphabet, Plate CL.) The firft of thefe marks is the beft when feparately formed, but does not join well with the *l* or *r*. For fimilar reafons, fome other of the confonants have more than one mark alloted to them.

One or other of the two marks appointed for *w* is always to be ufed when it is an initial letter; in other fituations we fcruple not to exprefs it by a dot in the *o* or *ou* place, writing *pour* for *power*; efpecially if it joins not well with the preceding confonant, or no great ambiguity arifes thereby.

The marks being thus adjufted to the particular confonants which they are to reprefent, let us fee how any precedent, fubfequent, or intermediate vowel may be affixed to any of thefe confonants, as occafion fhall require.

In feparate letters there is no difficulty, there being five diftinguifhable places for any given vowel or point, either preceding or following the confonant: reckoning, therefore, the vowels *a*, *e*, *i*, *o*, *u*, according to the eftablifhed number and fequence, *a* is to be placed at the beginning of the confonant, *e* at the end of the firft quarter, *i* at the end of the fecond quarter, that is the middle, *o* at the end of the third quarter, and *u* at the end of the confonant itfelf.

In the perpendicular and inclined letters, the vowels which precede are placed upon the left hand; thofe which follow, upon the right; becaufe we write from left to right; as for example, *at*, *et*, *it*, *ot*, *ut*; *ta*, *te*, *ti*, *to*, *tu*. N° 6.

In the horizontal letters, the vowels which precede are placed above; thofe which follow, below; becaufe we write from top to bottom; as, *as*, *es*, *is*, *os*, *us*; *fa*, *fe*, *fi*, *fo*, *fu*. N° 7.

In the femicircular letters, the vowels *a*, *e*, *o*, *u*, are placed upon the left hand, the *i* above when they precede, and the contrary when they follow, agreeably to the two foregoing remarks; as, *am*, *em*, *im*, *om*, *um*; *ma*, *me*, *mi*, *mo*, *mu*. N° 8.

A vowel between two confonants may be referred to either, and therefore feems to have two places: but in letters which form an angle when joined, this is the cafe of *i* only; for *a* and *e* can only be placed immediately after the firft confonant, *o* and *u* only before the laft; left *a* and *e*, if placed before the laft, fhould, in the narrow part of the angle, be confounded with *u* and *o* after the firft; as, *rat*, *ret*, *rit*, *rot*, *rut*. N° 9.

This twofold place of *i* may be of ufe in diftinguifhing, when thought neceffary, the fhort *i* from the long one, by making it fhort when placed immediately after the firft confonant, long when before the fecond; as *quit*, *quite*, N° 10.

The great difficulty of learning the true pronunciation of our language, occafioned chiefly by our perplexed, various, and confufed way of fpelling, has been always matter of much complaint with all foreigners who have attempted to learn it. But this abfurd irregularity is by far the moft remarkable, in the cuftomary management, or rather mifmanagement of the vowels. It is hardly poffible to give a rule for them, againft which the exceptions will not be almoft as numerous as the agreeing inftances. How frequently do we put two, nay fometimes three vowels, to exprefs the found of one only? What, for example, has the *e* and *a* to do in the word *beauty?* The fhort-hand writer, however, is not embarraffed with any of thefe difficulties. He, totally difregarding the common way of fpelling, is to infert only fuch letters as are pronounced; and muft confequently write the word *beauty* thus, *buty*. But the infertion of more vowels than are neceffary to the found is not the only inftance of irregularity to be met with;—there being more than five vowel-founds in our language; and cuftom, having allotted only five letters to fignify them all by, often makes one vowel exprefs two or three different ones, nay, even diphthongs or combinations of vowels. We therefore, taking the advantage which cuftom in this cafe affords us, fhall extend the power of our dots or points to the fame degree: The fairnefs and propriety of doing this will more fully appear upon a particular examination of all the vowels in their order.

And firft, in common writing, the letter *a* has three powers, *viz.* that of *a*, of *ai* or *ay*, and of *au* or *aw*; as in the words *father*, *fable*, *fall*, or *amen*, *able*, *altar*; which are pronounced all one as if they had been written *father*, *faible*, *faul*, or *amen*, *aible*, *aultar*: fo that we are fairly authorifed to extend the power of our vowel or point to the fame degree in all other inftances.

The vowel *e* fometimes expreffes fingly the found that two of them are often made for, as in, *he*, *me*, *we*; where its found is the fame as that of two *e's*, as in *fee*, *tree*, *agree*, &c. We are therefore free to ufe one *e* in this cafe, whenever it fuits our purpofe, as well as for *ea*, *ey*, *ei*, *eo*; for of what ufe is the latter of thefe vowels in *pea*, *prey*, *heifer*, *people*, but to puzzle children and foreigners?

The fame irregularity and confufion is obfervable in the cuftomary management of the other vowels, *i*, *o*, and *u*; they each of them fingly expreffing feveral different founds, which alfo are denoted at other times by feveral different combinations of them. The vowel *i*, for inftance, when it is fhort, is founded in Englifh as *ee*, agreeable to the pronunciation of it in moft foreign languages; when long, it has always the found of a diphthong, or combination of the two vowel-founds, (which we might exprefs by the open *a* or *au*, and the fhort *i* or *ee*;) which found or diphthong is alfo fometimes expreffed by *oi*, as *fill*, *file*, *foil*, *fin*, *fine*, *foin*.

In like manner, the vowel *o* has feveral different founds; as in the words *pol*, *pole*, *do*: the found of the *o* in *pole*, is fometimes expreffed by *ow*, as to *fow*; fometimes by *wo*, as *fword*; fometimes by *oa*, as *foal*; its found in *do*, by *oo*, *wo*, and *ough*, as *too*, *two*, *through*.

And laftly, the found of *u* (which is always really a diphthong,

thong, expreſſible by the combination of the two vowel ſounds *ee* and *oo*) is denoted in a great variety of ways in our common ſpelling, viz. by *u*, *ue*, *eu*, *ew*, *ieu*, *iew*, *ugh*, *eau*, *you*; as in the words *tune*, *due*, *few*, *adieu*, *view*, *hugh*, *beauty*, *you*. We are therefore certainly at liberty to repreſent all theſe by a point, in the place of the vowel *u*; and thus not only all the ſingle vowels, but all the combinations of them, are expreſſible by the ſhorteſt and eaſieſt of all marks, *viz.* a dot in the place of the vowel of neareſt ſound.

We will now proceed to examine what further uſe we can make of theſe marks or letters for the purpoſes of ſhort-hand. And as numeral figures exhibit to us a kind of ſhort-hand with which every one is acquainted, an alluſion to them will perhaps explain what we have to ſay hereupon.

Obſerve, then, the figures by which the words or numbers, one, five, four, ſix, are expreſſed in the Roman characters, which are likewiſe ſome of thoſe which we make uſe of: I, V, IV, VI. Here we ſee the figure I is conſidered in three different ſituations, as ſtanding by itſelf, cloſe before, and cloſe after another figure: and has accordingly three different powers, of numeration, ſubtraction, and addition. When it ſtands by itſelf, its name and power is one; when it is cloſe to, or belongs to another figure, it loſes its name, yet retains ſomething relative to its power, by leſſening or increaſing that other figure by one; and both together concur to ſignify but one word or number, vulgarly expreſſed by the ſingle figure of 4 or 6.

To apply this to ſhort-hand; let the ſame character | , being our letter *t*, have alſo its three diſtinct powers, *viz.*

Firſt, When it ſtands by itſelf, let it expreſs the commoneſt word or particle in our language the initial conſonant of which is a *t*: let the name therefore of this character, for inſtance, be *the*; a word which we have ſuch perpetual occaſion to write.

Secondly, When it is placed cloſe before any other characters, let it ſtand for the commoneſt prepoſition, or leading part of a word, that begins with the ſame conſonant; which in this caſe will be *trans*.

And thirdly, When cloſe at the end of other marks, let it ſignify the commoneſt ending or termination, of which the firſt (or only) conſonant likewiſe is *t*, viz. *ity*

From this eaſy and regular aſſignment of a threefold power or ſignification to a conſonant, a threefold advantage naturally follows. 1ſt, By allotting to every mark ſtanding by itſelf, a name, *viz.* that of the commoneſt word or particle of which it is the firſt, we ſhall have a number of words, one or other of them perpetually occurring, diſpatched by the ſingle characters of the alphabet, which otherwiſe, when ſingle, would ſtand for nothing

2dly, The prepoſitional part of a word being deſcribed by its leading conſonant in cloſe ſituation, but unjoined to the following part of it, ſecures alike the beauty and the brevity of the characters in many caſes wherein it could not otherwiſe be maintained; and alſo renders arbitrary marks needleſs and ſuperfluous; there being no ſort of occaſion for complicated crotchets, where the ſimple letter determines preciſely enough the prepoſition wanted.

3dly, As it does likewiſe the termination, by its near approach to the end of characters; when, by the mutual help of each other, they deſcribe a word ſufficiently to diſtinguiſh it from all others.

Thus, in the inſtance here alluded to, the ſame ſtraight lines, and the ſame ſituation of them, by which four different numbers are expreſſed in numeral ſhort-hand, are thoſe by which we ſhould, in literal ſhort-hand, expreſs occaſionally four ſuch words as the letters and ſimilar uſe of them juſt hinted at would deſcribe, *viz.* in the numeral I *one*, V *five*, IV *four*, VI *ſix*; in the literal I *the*, V *fr*, IV *transfr*, VI *frity*.

For though the initial and final power of a conſonant could not, indeed, be expreſſed in this manner by a bad alphabet, and a piecemeal huddling of its characters up and down, to denote the vowel's places; yet, in a well contrived one, where conſonants of ſhorter words fall eaſily, by one continued ſtroke, into each other, a break in thoſe of longer ones may be ſo deſcriptive of their initial or final ſyllables, as often to expreſs the whole with a conciſeneſs which many ſhorter words may not admit of. Every conſonant, then, may denote, according to its ſingle, previous, or final ſituation, a common word, prepoſition, or termination.

But the horizontal ſtraight line may be made from the top, middle, or bottom of the ſaid horizontal ſpace, that is, from the place of *a*, *i*, or *u*: ſince, then, theſe vowels before an *s* make the three common words *as*, *is*, *us*, it may as well ſtand for them all, in their ſeveral places, after this manner, *as*, *is*, *us*. N° 10.

Trans is the only common prepoſition beginning with *t*: but there are three common ones that begin with *s*, viz. *ſuper*, *circum*, (or, as we ſhould write it according to nature, *ſircum*) and *ſub*, which the horizontal ſtraight line may alſo ſtand for, at the top, middle, and bottom of the line: *circum* in the middle, becauſe of its firſt vowel *i*: but if, for the like reaſon, *ſuper* and *ſub* were both written at the bottom, it might occaſion an ambiguity; therefore we make *ſuper* over *circum*, and *ſub* under it, becauſe (in Latin) they ſignify *over* and *under*.

Again, the commoneſt termination in our language is *ſion* or *tion*; in pronunciation, *ſhon*. There are a thouſand words, all in general borrowed from the Latin, which end in this manner, the greateſt part of them of common uſe. Now let the letter *s* be drawn near to the end of any of theſe words, from the place of the vowel preceding the *ſion* or *tion*, and it will ſerve for any three final ſyllables whatever of the numerous words that afford this termination.

A few inſtances may ſuffice; as, *oration*, *repletion*, *attrition*, *promotion*, *effuſion*, N° 11. And alſo, when one or more conſonants intervene between the vowel and termination *tion* or *ſion*, they are, by the rule, to be expreſſed by the *s*, drawn from the vowel's place; as, *attraction*, *attention*, *affliction*, *adoption*, *eruption*, N° 12.

All the reſt of the conſonants are to be conſidered in the ſame threefold light, *viz.* as ſtanding by themſelves, as placed cloſe before, or cloſe after other marks; and muſt, accordingly, have a power of denoting ſome common word, prepoſition, or termination, in which that conſonant is found. This is the general rule; but in practice there are few prepoſitions and terminations neceſſary or uſeful beſides thoſe ſet down in the alphabetical table. This rule is very convenient in ſome caſes; as where the conſonants of which the word is compoſed join not well together, or cannot be kept within the parallels; for inſtance, in *behold*, *inhabit*, *depoſit*, N° 13. and affords a great contraction in others, as *underwritten*, *diſtinction*, *direction*, N° 14. But here it is to be obſerved, that, in placing the termination, regard

is

is to be had to the vowel's place with refpect to the line, and not to its place after the laft confonant, (except that happens to be one or other of the three horizontal characters *s*, *k*, or *q*,) as in the above word *direction:* the *s* is drawn from the *e*'s place in the line, but it is in the *o's* place with refpect to the laft confonant *r*, which appears evidently to have begun at the bottom of the line. But when *s*, *k*, or *q*, immediately precede the termination, regard is then to be had to the vowel's place after the letter; as *affumption affertion*, (N° 15. firft and fecond examples.) The plural number of the termination is denoted by adding a little *s*; as *verities*, *diftinctions*, (*ibid.* third and fourth examples.)

Before the learner begins to write by the preceding alphabet, it may not be improper to premife a few obfervations upon the form and refpective proportion of the letters, and the ways of joining the curved ones with the moft eafe and elegance.

Firft, All the perpendicular and inclined letters (that is, all the letters except *s*, *k*, *q*, *m*, *n*, *ch*, and *g*,) are made to touch two parallel lines, the diftance of which is meafured by the perpendicular ftraight line *t*, as in N° 16.; but, however, thefe letters are fometimes, for greater convenience, made of half-fize, and two of them included between the parallels, as in the feventh and eighth examples, N° 16.

The letters *m*, *n*, *ch*, and *g*, are femicircles; the diameter of which is the *s*, and their radius or height is rather more than one third part of the *t*.

The letters formed from the three ftraight lines *t*, *r*, and *f*, are fegments of larger circles, whofe chords are the letters *t*, *r*, and *f*, refpectively.

It muft be obferved, however, that it is not neceffary, nor indeed fcarce poffible, that thefe proportions fhould be exactly kept, efpecially in quick writing; but they are given here, becaufe the nearer they are kept to, the more beautiful the writing appears.

Secondly, When *m* and *n* are joined together, they are not each of them to be made complete; but a part is to be cut off from each of them; and in the fame manner the inclined letters, when joined with *m* or *n*, are not made complete, but, running into one another, lofe each a part, as N° 17. So the reft of the curve line letters, when joined together, are made to run into one another fmoothly; avoiding, by this means, that ftopping of the pen which the making of any angle neceffarily occafions; as for inftance *mp* is not written, as in the firft example N° 18. but as in the fecond, part of the curved line being in common both to the *m* and *p*.

Thirdly, The twirl is always made at the beginning, never at the end of any letter; whenever, therefore, the fix laft characters (N° 18.) occur, they muft be fuppofed to have been begun from the bottom of the line.—The general rule is, That all perpendicular and inclined letters are to be begun from the top, and drawn downwards; but in all inftances, in which the inclined letters (N° 19.) will join better with the preceding or following marks if drawn upwards, they muft be drawn in that direction, as in thefe words, N° 20.

Fourthly, The initial or final vowels (the *e* mute excepted) are generally expreffed, and the middle ones omitted, except in cafes where there are many words confifting of the fame confonants which might be liable to be taken for one another. But all words which have one confonant only (except thofe in the table of the alphabet, which are expreffed by the letter alone) muft always have the proper vowel point expreffed, as *by*, *to*, &c. becaufe thefe little words are, as it were, the keys of the fentences in which they are found.

Fifthly, Few monofyllables beginning with a vowel are immediately followed with either *h* or *w*; for which reafon, thefe characters, having a point before them, denote *ht* and *wt* refpectively, with the proper vowel between them; as *hat*, *het*, *hit*, *hot*, *hut*, and *wat*, *wet*, *wit*, *wot*, *wut*, N° 21.

Sixthly, As the horizontal letters *s*, *k*, *q*, and the curved ones *m*, *n*, *ch*, and *g*, may be written at the top, or bottom, or any part of the line, the vowel following them may be expreffed by their fituation between the parallels; as *fan*, *fun*, *man*, *mun*. N° 22.

Seventhly, The firft mark for the *th* in the table, not joining well with the mark for *r*, which, however, is very frequently combined with it; and the other *th*, being, by reafon of our cuftomary method of leaning the letters the contrary way in common writing, not fo readily made; *t* may be put for *th*, when the adjoining letter is of half fize only, as *thr*, *rth*, *thm*, *thn*, *ths*, N° 23. In other cafes, a letter of half fize fignifies that the adjoining one is to be refolved into two letters, as *trr*, in the firft example N° 24.; for here the *r* being twice as long in proportion to the *t* as it ought to have been had only one *r* been defigned, fhows, that in this cafe the *r* of double length denotes *rr:* but, in the fecond example, the laft character does not fignify *ll*; for it cannot be refolved into *ll*; but it may into *lf;* for if you divide the laft character into two halves, the lower is our mark for *f:* in like manner, the third example is *flt*.—When there is no other confonant to be joined to the inclined letters *f* or *r*, the lengthening of them by a greater inclination than ufual denotes that they are to be refolved into two letters *rr*, *ff*, or *vv*, *fv*, or *vf*; as in the three firft examples, N° 25. *error*, *five*, *feoffee*: but when two *t*'s form a word, as for example the word *taught*, or, as we fhould fpell it, *taut*, this expedient cannot be ufed, without going either above or below the line, which is not to be done upon any account whatfoever. In this cafe a little break muft be made in the *t*, to fhow that there are two *t*'s, N° 25. This muft be confeffed to be not altogether regular, and conformable to our rules of joining the letters; and, had many inftances occurred, their frequency would have furnifhed a juft objection againft our alphabet; but on the contrary, the repetition of the *t* forming fewer words than that of the other confonants, was one reafon of appropriating the perpendicular line to the *t*, the word *taught* being the only one that often occurs in practice.

Eighthly, In fome few inftances, where a letter joins not well with the preceding one, as the *g* with any drawn downwards, the *ch* with any upwards, and the *j* with neither; we fcruple not to borrow the oppofite one, or fome other of nearly the fame found, in its ftead; writing, inftead of *voyage*, *voyach*; *fikure*, for *figure*; *churfh*, for *church*; *machefty*, for *majefty*; N° 26. And when *n* happens to be at the bottom of the line and is followed by *d*; for the fake of eafy joining, we write *p* inftead of the *d*, as in the firft example N° 27. *fnp* for *fnd*; and few words in our language ending in *np*, this can caufe little ambiguity.

Ninthly, *Cm* and *cn* occurring very frequently, for the fake of difpatch we fhorten the marks for *k* and *q*, when followed by *m* or *n*, as in the third and fifth examples, N° 27.

N° 27. Thefe cannot be miftaken for *ch* and *g*, the twirl being on the contrary fide.

Tenthly, The firft mark, N° 28. placed clofe after a word, denotes, that there is one fyllable ftill wanting to complete the word, and *ing* being a very common final fyllable, it is often fo denoted; as, *being*, *writing*, No. 28.

Eleventhly, A point ftanding by itfelf has a power, as well as the confonant marks, of reprefenting a common word. At the top of the line, it fignifies the particle *a*; as, *a man:* in the middle *I*, or *eye*; as, *I will*, *his eye:* in the *o*'s place *o*; as, *O Lord:* at the bottom *you*; as, *you will*. N° 29.

Twelfthly, The common way of writing numbers being very compendious we generally ufe it when numbers occur. The comma, as it does not refemble any of our fhort-hand marks, may always be ufed; but when a full ftop is thought neceffary, the fmall circle after the examples, No. 29, may be ufed inftead of the point.

To thefe rules it may be proper to add a few obfervations. In writing words (as before obferved) we join all the confonants, that are wanted, together; to which, if they fuffice to diftinguifh a word, it is needlefs to add any of its vowels. As for inftance, to write the word *ftrife*, we join the four confonants of which it is compofed into one continued mark or figure comprifed within the due limits, as in N° 30. firft example: for if, without regarding the limits, we fhould make it as in example fecond, the letters would be the fame indeed; but the direction in this, and all fimilar cafes, is evidently more incommodious. When, therefore, there are different ways of joining the fame letters together, we muft accuftom ourfelves to the beft, or moft lineal. The famenefs of the entire figure, as well as that of its compofing letters, is worth the writer's while to maintain; and alfo facilitates mutual reading between the fellow-practifers of the fame method. There is a kind of mechanifm in the cafe, by which the attention, being lefs fatigued with any deviations of unufual appearance, eafily apprehends the meaning of that which is more conformable to a ftandard.

Though the letters *ftrf* are abundantly defcriptive of the word *ftrife*; yet if any one pleafes, he may add the point for the vowel *i*, (as in the example, N° 30.) to fuggeft the word to him at firft, until he can read it readily without that affiftance.

In fingle words, the chief difficulty is, to unlearn the unnatural and perplexed method of fpelling to which we have been long habituated. In this word *practice*, for example, the confonant *c* is pronounced as *k* in the firft fyllable, and as *f* in the fecond, and the vowel *e* has no pronunciation at all. But, being ufed to thefe difficulties, it is now become one to know the word by its true and genuine fpelling according to our fhort-hand alphabet, viz *praktis*.

It may highly perplex a carelefs writer of new characters, to decypher the true fenfe thereof: though it fhould be eafy enough to know it, by a little application and practice. But what child would not fooner learn to read this fame fentence, if, after being taught the ufe of his alphabet, he fhould have it thus written?—*It ma hili perpleks a karles riter of nu karakters, to defifer the tru fens thereof; tho it fhud be efi enuf to kno it, bi a litl aplikafhon and praktis.*

Inftead, therefore, of fcrupling to return from fuch cuftomary rules as children are firft initiated in, to a more juft and alphabetical way of writing fhort-hand, men may eafily be taught, when ripened into fome acquaintance with their mother-tongue, to reverfe the liberties perpetually taken in long-hand; that is, inftead of employing more letters than are precifely neceffary to exprefs the found of words, they may make ufe of fewer, not only difmiffing fuch as are needlefs to the found, but fuch alfo as may be omitted, and yet leave the fenfe of the words eafily difcoverable. If they can tell what is wanting, it is all one as if it was there; the lefs expreffion there is, fo much the better for the purpofes of brevity, which juftifies the greateft omiffions, provided what is left be intelligible.

And though the omiffion of the vowels in the middle of words may, for a while at the firft, make it difficult for a learner to read even his own writing without hefitation; yet that difficulty will certainly vanifh, in proportion as the fhort-hand marks become familiar to him, as it arifes, not fo much from that omiffion, as from the ftrange and unufual appearances which the characters make to his eye, and which, for that reafon, do not fuggeft to him the confonants, for which they ftand, fo immediately, but that the attention of the mind is neceffarily taken up in recollecting them one by one; whereas, did they appear fo familiar and well known to him as all to be apprehended in one view, he would foon difcover the word, though all the middle vowels were left out. If any one doubts this, he may foon convince himfelf, by writing in the common long-hand exactly the fame letters which he had written before in the fhort-hand characters; and if he can read it with eafe when fo tranfcribed, he may be certain that a little cuftom will make the reading of fhort-hand every whit as eafy to him.

And now, the way being fufficiently cleared before him, the learner, after he has, by repeated trials, acquired a facility of forming, with tolerable exactnefs, all the letters of the alphabet feparately, and of remembering what particular confonant each of them reprefents, may proceed to join two or three of the marks together; writing at firft only fhort words, and frequently trying different ways of joining the marks, in order to difcover the beft, and moft elegant. Several of them being formed almoft as eafily upwards as downwards, he will find it convenient fometimes to begin from the top, fometimes from the bottom of the line, according to the nature of the mark which follows; and when two marks, which admit of being written downwards only, come together, the line muft be divided between them, making each of them half the ufual depth, as in examples firft and fecond, N° 31. and, in fome very rare inftances, he will be forced to make them three deep, as *ftupid*, (example third;) except he chufes to make ufe of the expedient of borrowing the *b*, a letter not very different in found, writing *ftubid* for *ftupid*, as in the fourth example.

That the learner may proceed with the greater eafe and certainty, we have given fpecimens of writing according to the above rules, (Plates CLI, CLII,) for his imitation. He ought to make himfelf fully mafter of the firft fpecimen, by reading and copying it over and over with great care, until it becomes quite natural and familiar to him, before he proceeds to the fecond; and he ought in the fame manner to make himfelf throughly acquainted with the fecond, before he proceeds to the third. Thus moving with flow, but fure fteps, he will in a very few days find, that every difficulty has difappeared, and that nothing remains but to practife till the habit is acquired. If he has the curiofity to compare the number of ftrokes and dotts in his firft fpeci-

men in ſhort-hand, which is the Lord's prayer, with thoſe uſed when it is wrote in the common way, he will find, that the former contains only about 150, while the latter contains near ſix times that number; which ſhews how much time and labour may be ſaved, even by the few ſimple rules already given.

PART II.

AN alphabet, formed upon the moſt juſt and natural plan, by which, with the help of a few general rules, all the words of the language to which it is particularly adapted, may be eaſily, neatly, and ſpeedily written, will not be ſufficient to ſatisfy the expectations of an inquiſitive reader; who muſt be ſenſible, that however complete the alphabet may be, yet many compendious applications of it may be obtained by a proper inquiry into the nature of our language, and the abbreviations which it admits of. He will not be ſatisfied with being taught only how to expreſs all the letters of a word by the ſhorteſt and eaſieſt ſtrokes, but will alſo require further inſtruction how to deſcribe intelligibly words and ſentences by as few of thoſe ſtrokes as poſſible. To inveſtigate, from a few things given, many which are omitted, will be found no unpleaſant nor unprofitable exerciſe of the learner's ſagacity; and if the few be properly given, the ſenſe of the paſſage, and a due attention to the idiom of our language, will render the diſcovery of the omiſſions more certain, and alſo leſs difficult, than the unexperienced can eaſily imagine.—Without ſome ſuch rules of abbreviation, one end of ſhort-hand, that of following a ſpeaker, would ſcarcely be attainable.

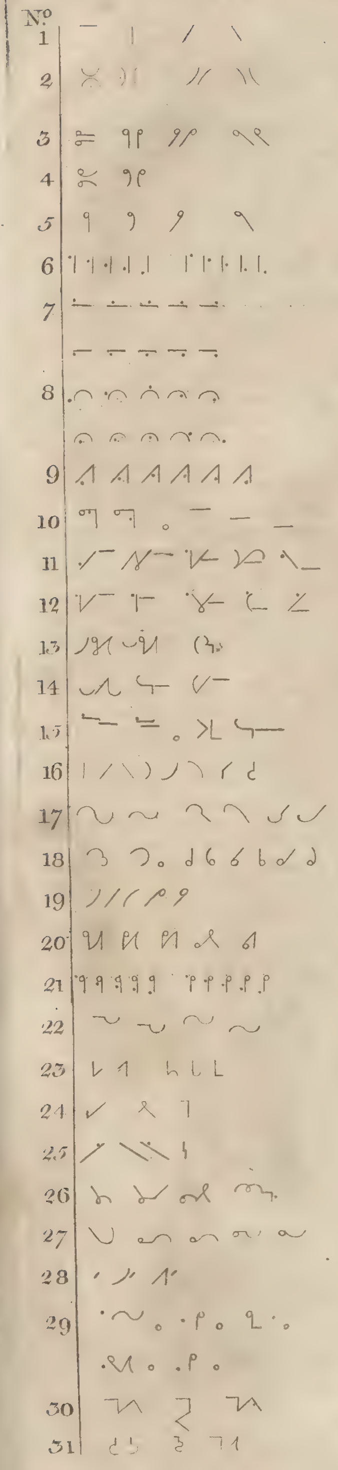
Before the invention of the art of printing, the tedious-neſs of writing all the words at full length put the copiers of books upon forming many ways of abbreviating them, as appears in all manuſcripts. In thoſe of the New Teſtament we find many principal words deſcribed by their initial and final letters only, with a daſh over them. In Latin manuſcripts, thoſe terminations, by which the relations of words to one another are in that language uſually expreſſed, were generally omitted: nor was there any need of writing them at length; for the principal word being given, of which the reſt were governed in caſe, gender, and number, any reader who underſtood that language could eaſily ſupply thoſe omiſſions. Our language, generally expreſſing thoſe relations by little particles, does not indeed afford that particular mode of abbreviation. Upon a careful examination, however, it will be found capable of furniſhing many others as uſeful and extenſive.

But it will be proper, before we proceed further in this art of abbreviation, to advertiſe the learner, who is apt to be too eager to puſh forward, not to embarraſs himſelf with it, till, by a competent practice of writing according to the rules laid down in the firſt part, he is become ſo well acquainted with the characters, as to be able to write and read them with as much eaſe as his own common hand. The beſt way to learn any art is to proceed by degrees, not venturing upon a ſecond ſtep before the firſt is perfectly maſtered. And it is evident, that this method of proceeding is, on this occaſion, particularly neceſſary: for though, in many ſentences, the ſenſe, and the particular conſtruction of the words, may plainly enough point out ſuch of them, as are deſcribed with unuſual brevity; yet how ſhall an unpractiſed learner, unable to embrace in one view the words denoted by the preceding and following marks, determine what the intermediate contracted ones muſt needs be? But, if he will have patience to abſtain from this ſecond part, until he can write readily, and read without heſitation whatever is written, according to the rules of the firſt, he may reſt aſſured that he will meet with little more difficulty in reading words contracted than he did in thoſe written more at length, provided that the rules of abbreviation be duly attended to. But, if the reader expects that we are to give him every particular manner of abbreviation which can poſſibly be invented, he will be diſappointed. The principal and moſt uſeful rules are given; and it is left to the ſagacity of the practiſer, by obſerving the nature of theſe, and proceeding upon the ſame principles, to make ſuch further advances as his occaſions may require. It would be vain to pretend to have exhauſted a ſubject which is as extenſive as the language itſelf in which we write; and conſequently may be carried further and further by every one, in proportion to his ſkill in the language, and his knowledge of the ſubject treated upon.

The learner has been already taught how to write all the conſonants of any word by one continued mark, thoſe words only excepted which may be more briefly deſcribed by the help of prepoſitions and terminations. He may now advance a ſtep further, and join together ſuch ſhort words as are either repreſented by the letters of the alphabet alone; or ſuch as, by their frequent occurrence, are become ſo familiar, as to be readily known, though denoted by their firſt conſonants only. This will be found a greater ſaving of time than can eaſily be imagined; and muſt therefore, when diſpatch is required, be done in all inſtances in which they may be joined neatly and without ambiguity.

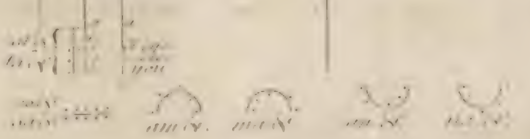
Rule I. The different times and modes of the verbs are generally expreſſed, in the Engliſh language, by the help of other verbs, for that reaſon called auxiliary; as, *will, ſhall, have, had, can, could, may, muſt be*, &c. Theſe muſt, upon that account, occur very frequently; and, being ſignified by their firſt conſonant, they may be joined to one another; as, *can be, will be have* or *has been, to be, ought to be, muſt be*, Plate CLIII N° 1. and when the negative particle *not* intervenes, it may be denoted by its firſt conſonant, and be joined with them; as, *cannot be*, N° 2. *will not be, have not been, not to be, ought not to be*, N° 3. When theſe joinings are, by a little practice, become eaſy to the learner, he may proceed further, and join the preceding pronouns to theſe auxiliary verbs; as, *he muſt be, he cannot be*, N° 4. This can occaſion no ambiguity: for though he was taught in his alphabet, that theſe two marks (N° 5.) denoted, the former *have*, and the latter *had*; yet, when placed immediately before *muſt* and *can*, their ſituation ſhows that they cannot, in that caſe, ſignify *have* and *had*, thoſe auxiliaries never admitting of ſuch an arrangement. And further, as *w* and *h* are often dropt in common ſpeech and writing, as *he'll* for *he will*, *we've* for *we have*; ſo they may, for the ſake of joining, be omitted in ſhort-hand; as, *he will, he will not be, they have been*. N° 6.

Rule II. The learner was taught in the firſt part, That in

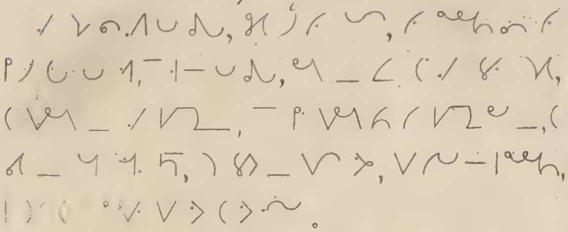


A Table containing the Alphabet, the common words which the letters stand for, the Prepositions and Terminations.

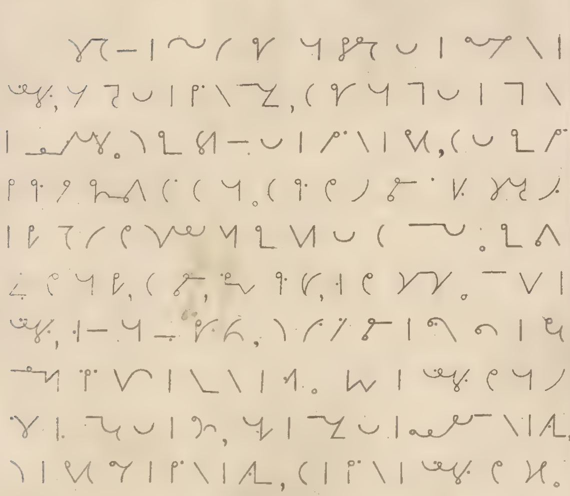
		Names	Prepositions	Terminations
	b	be but	be	ble or able
	d	and	de or dis	de
	f	of	for	ify
	g	against		
	h	have had		
	j	Judge Just		
	k	can could	con or com	ical
	l	all		
	m	amongst	mis	ment
	n	an in under	ante or an inter or in under	ness
	p	upon	proper pro	
	q	question		
	r	or	re	ary
	s c	as is us	super circum sub	a e i o u tion or sion
	t	the	trans	ity
	w	will would	with	ward
	x	accept exercise	ex or extra	
	y	yet		
	ch	which		
	sh	shall should		ship
	th	that		



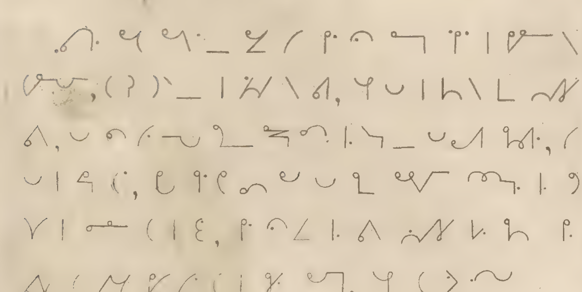
The Lord's prayer.



The first Psalm.



The first Collect.



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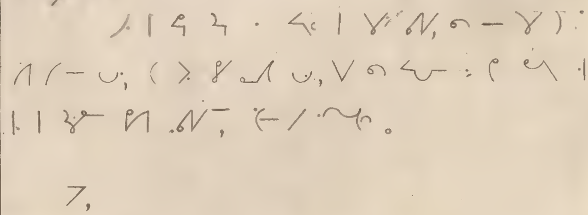
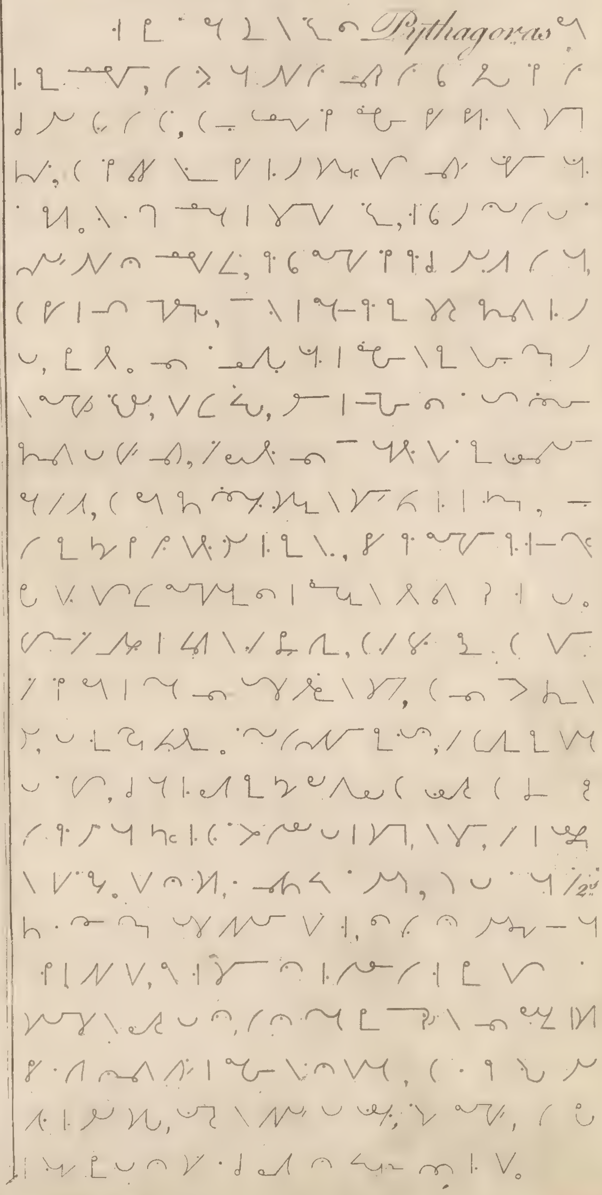




Spectator Vol. 8th (No. 586 continued

in writing all the confonants of which any word was compofed, the beginnings of the marks which follow muft always be joined to the ends of thofe which precede them: Whenever, therefore, they are joined in any other manner, it is to denote, that each particular mark fignifies a whole word, and not a fingle letter: as for example, the particular way of joining the letters in the firft example, N° 7. is a fufficient indication that they were not intended to reprefent a word confifting of thofe two confonants, but two words; and the *n* in the middle of the line ftanding for *in*, and the *t* for *the*, *in the* may be written as in that example. So again, the fecond example, N° 7. denotes two words; and the *s* being drawn from the place of the vowel *i*, fhows the latter of them to be *is*: and though the ftraight perpendicular line ufually reprefents the article *the*, yet, in that fituation, it cannot poffibly do fo; for that article can never come immediately before a verb, but the pronouns very frequently do. *It is* may therefore be very commodioufly written as in that fecond example; and *it is not to be*, *as it is*, *fince it is*, may be written as in N° 8. and by dropping *w*, as before, we may write *it'as*, for *it was*, *it was not to be*; *it'ere to be*, for *it were to be*; *it feems to be*; as in N° 9. for the *s* being drawn from the place of *e*, fhows that it muft be either *it es——to be*, or *it se——to be*; and *it feems to be* is fo very common a phrafe, that it will not give much trouble to the reader, though written in this concife manner.

Rule III. Points being the fhorteft of all marks, it would argue a great want of œconomy, as well as invention, not to make all the ufe of them that can be made confiftently with the regularity of our fyftem. The power of reprefenting prepofitions and terminations, which was allotted to the confonant marks, could not be given to the points: for, in that fituation, they ftand for the vowels; and all the diftinguifhable places, both before and after the confonant marks, are already taken up by the five vowels: but a point placed directly over or under the beginning or end of any of thofe marks, has as yet had no fignification annexed to it. As for inftance, in the fecond example, N° 10. the point being fo placed, that if the *t* was produced, it would pafs through it, is very diftinguifhable from all the vowels. All derivative fubftantives may therefore be very conveniently reprefented by making the point ftand for the fubftantive derived from the word at the end of which it is placed; fo the two examples, N° 10. fignify *forget*, *forgetfulnefs*.—But as there are derivative adjectives and adverbs as well as fubftantives, it will be a great compendium to reprefent them alfo by points, diftinguifhable, by their fituation, both from the fubftantive and the vowel points; which may be done by placing them in a line, which, if produced, would pafs through the fubftantive-point, and would alfo be perpendicular to the laft confonant mark; and by making one placed before the fubftantive-point to fignify the adjective, one after it to fignify the adverb: As, *forgetful*, *forgetfulnefs*, *forgetfully*, N° 11.; *reafonable*, *reafonablenefs*, *reafonably*, N° 12.; *fufficient*, *fufficiency*, *fufficiently*, N° 13.

Rule IV. Although the above defcribed mode of abbreviation is very extenfive, there being in our language a great number of long words derived from fhort ones; yet it is far from being the only ufe which may be made of thefe adjective, fubftantive, and adverb points. In all difcourfes whatever, there muft be fome principal words, which, either by their more particular relation to the fubject, or frequent occurrence, will be eafily difcoverable, however concifely written. If fuch words begin with a confonant, the firft letter, if not the firft vowel and confonant, with the adjective, fubftantive, or adverb point annexed, will fuggeft them immediately; and therefore will be, though a brief, yet a fufficient defcription of them. As for inftance, if the following paffage be tranfcribed out of a difcourfe upon the folly of worldly-mindednefs, in common long-hand, after this manner, *Our bleffed L———, both by his preaching and ex———, has fully fhown us the vanity and folly of feeking for folid and lafting h——— in the poffeffion of any of the goods of this prefent w———*; every one muft immediately fee, that the words, defcribed by their initial letters, are too plainly pointed out by the nature of the fubject, and their accompanying epithets, to leave any room for doubt or miftake. In following a fpeaker, the fame defcription of them in fhort-hand muft therefore be allowed to be fufficient. But it may not be amifs to give another inftance or two, with the fhort-hand characters for the abbreviated words; as, *Life and* IMMORTALITY *are brought to light by the* GOSPEL; or again, *The* RESURRECTION *of the dead, and a future ftate of* REWARDS *and* PUNISHMENTS, *are plainly and pofitively taught in the gofpel.* In thefe inftances, *immortality*, *gofpel*, *refurrection*, *rewards*, and *punifhments*, may be wrote as in N° 14. So in writing after pleaders, who frequently ufe the expreffion *with fubmiffion to your Lordfhip*, the words *fubmiffion* and *Lordfhip* may be wrote as in the firft and fecond examples, N° 15. and if the adjective *humble* be joined to *fubmiffion*, it may be denoted by its firft confonant, and be joined to the fubftantive; and the words *humble fubmiffion* may be written as in the third example. This will be found a very ufeful compendium; for there are many fubftantives to which fome particular adjectives are ufually joined; as, *human nature*, *Chriftian religion*, *natural philofophy*, &c. Whenever, therefore, the fubject treated of will lead to the difcovery of the fubftantive, though denoted only by its firft confonant, it will, at the fame time, difcover the adjoined adjective. This method may indeed appear, at firft fight, to clafh with the rule about derivative fubftantives; but it will feldom happen that the two confonants will compofe any word from which another can be derived; or if it fhould, it would fcarcely ever be fuch a one as would agree with the context.

It will appear evidently, upon a little confideration of the nature of this mode of abbreviation, that no limits can be fet to it; but that it may be more or lefs frequently ufed, in proportion to the knowledge, fkill, and readinefs of the writer, which will enable him to judge in what inftances fuch liberties may be taken without occafioning ambiguity. And every writer may accuftom himfelf to mark fuch words as moft frequently occur in his own particular profeffion, by the initial letters, with the fubftantive, adjective, and adverb points refpectively, which, through cuftom, will eafily fuggeft thofe words to him at firft fight. But it muft not be underftood that thefe marks neceffarily imply thofe words, and no other: They may ftand for any other beginning with the fame letters, which the fenfe of the paffages requires. It cannot therefore be expected that a lift of them fhould be given here; but the following are fome of thofe which are moft commonly ufed: as, *God*, *happinefs*, *heaven*, *Lord*, *always*, N° 16.; *altogether*, *occafion*, *accordingly*, N° 17.; *notwithftanding*, *opinion*, *perhaps*, *religion*,

religion, N° 18.; *ſubject*, *together*, *world*, N° 19.

RULE V. An attention to that property of the Engliſh language, of expreſſing the different connections, and relations of one thing to another, for the moſt part, by prepoſitions, which the Greek and Latin, and ſome modern languages, do by varying the terminations of the ſubſtantives, will point out a further application of the dot to the purpoſes of abbreviation: for as, in the Latin manuſcripts, the root or body of the word being given, there was no neceſſity of writing the various terminations of the caſes, ſince any reader who underſtood that language could himſelf ſupply the particular termination which the caſe required; ſo, in Engliſh, if the two related ſubſtantives be ſuch as may be readily known, even when repreſented by their firſt conſonants only, they may be joined together, placing a dot at the point of their junction, to ſhow that they are both ſubſtantives; and the prepoſition connecting them may be omitted, for it may as certainly and as readily be ſupplied by the reader as the caſes in Latin before mentioned. This conſideration will therefore dictate the following rule, *viz.* That a dot placed at the point of concurrence of two conſonant marks, as in N° 20. denotes two ſubſtantives, of which thoſe marks are the firſt conſonants; and alſo that the latter is governed of, or connected to, the former, by ſome prepoſition which is omitted.

As for example, in this ſentence, *The ſum or ſubſtance of all the commandments is contained in the two following*, viz. *the* LOVE OF GOD, *and the love of our neighbour*; the words *love of God* may be wrote as in the laſt example: for as the particular ſituation of the dot denotes that both *L* and *G* are ſubſtantives, the article *the* before the firſt points out plainly enough the omitted prepoſition *of*; and the leaſt degree of attention to the words which precede and follow the contracted mark will diſcover that it muſt be the *love of God*.

Or again, *The* LOVE OF MONEY *is the root of all evil*; or, *Seek ye firſt the* KINGDOM OF GOD, *and his righteouſneſs:* theſe words *love of money*, and theſe other words *kingdom of God*, may be wrote as in N° 21.

The articles *a* or *the*, in this and in many of the following ways of abbreviation, may, for the ſake of joining, be omitted, as in the following ſentence, *Since the light of the goſpel has ſhone upon* the *world*, &c. the *light of the goſpel* may be written as in N° 20.

And further, though an adjective ſhould precede either of the ſubſtantives, yet they may all three be repreſented by their firſt conſonants joined together, with the dot always placed at the end of the firſt ſubſtantive. No difficulty can ever ariſe in diſtinguiſhing the adjective from the ſubſtantives. For, in the following ſentence, *The great goodneſs of God is manifeſt in all his dealings with his creatures*; if theſe words, *great goodneſs of God*, be written as in N° 22. the dot placed at the end of the ſecond mark ſhows that it muſt be the firſt ſubſtantive, the third muſt therefore denote the latter ſubſtantive, and the firſt conſequently the adjective. In like manner, in the following ſentence, *His Majeſty the King of Great Britain*, the words *King of Great Britain* may be wrote as in the firſt example, N° 23. for the dot being placed at the end of the firſt mark, it is evident that the firſt muſt be a ſubſtantive; and a little attention to the uſual arrangement of words in the Engliſh language ſuggeſts that the ſecond muſt be an adjective, as adjectives generally precede the ſubſtantives to which they are related: there is therefore as much given as if it had been written in long-hand thus, *His Majeſty, the K—— of G—— B——*; which, in a diſcourſe concerning him, would be ſufficient to diſcover that the contracted words muſt be *King of Great Britain*.

If each of the ſubſtantives have an adjective joined to them, there can be no difficulty for the firſt and third muſt be adjectives, except in ſome rare inſtances in which the common order is ſometimes changed, and the laſt adjective is put after its ſubſtantive, as in this, *the great goodneſs of God Almighty:* in ſuch caſes, either the laſt adjective muſt be ſeparated from the reſt of the mark; or, if joined, it muſt have the adjective dot annexed; and *the great goodneſs of God Almighty* may be written as in the ſecond example, N° 23.

This relation of ſubſtantives, which is expreſſed in Latin by the genitive caſe, in Engliſh by the prepoſition *of*, is by far the moſt common: but the rule is more extenſive, and ſerves to expreſs two ſubſtantives connected by any prepoſition whatſoever, as *for*, *in*, *with*, *after*, &c. provided that the context, or any particular words of the ſentence, eaſily indicate not only the two ſubſtantives which are denoted by their firſt conſonants, but alſo the prepoſition which ought to be inſerted. As, for example, in this ſentence, *Happy is it for us, if, convinced by experience of the vanity of putting our truſt in man, we place all our confidence in God*, the three laſt words may be expreſſed as in the firſt example, N° 24. For the context plainly points out the two ſubſtantives; and the verb *place* marks evidently, that the omitted prepoſition cannot be *of*, but muſt be *in*.

In this ſentence, *Our holy religion abſolutely forbids all inſtances of revenge, our Saviour expreſly commanding his diſciples to return good for evil*;—*good for evil* may be written as in the ſecond example; for the verb *return* ſhows plainly that it cannot be *good of evil*, but muſt be *good for evil*. It may, perhaps, be objected here, that *v* is not the firſt letter of the word *evil*; but it muſt be obſerved, that the words of the rule are, That the dot denotes two ſubſtantives, of which thoſe marks are the firſt conſonants, not the firſt letters; and a word may ſometimes be ſo pointed out by others which accompany it, as to be eaſily diſcoverable, though the initial vowel be omitted.

It may not be improper to add another example or two for the better underſtanding of this rule; as thus, *In this preſent ſtate there is no ſuch thing to be met with as pure unmixed pleaſure or pain, good or evil*; *here below all things are mixed, pleaſure with pain, good with evil.* The latter part of the ſentence, *pleaſure with pain, good with evil*, may be wrote as in the two firſt marks N° 25 for the word *mixed* requiring the prepoſition *with* after it, ſhows, that it cannot be *p*—— of *p*——, *g*—— of *v*——, but muſt be *p*—— with *p*——, *g*—— with *v*——.

Or, *He is now become quite blind, he cannot even diſtinguiſh light from darkneſs*. The laſt three words may be wrote as in the third mark, N° 25.

Or again, *If we conſider, that without health we cannot enjoy any of thoſe pleaſures which riches can procure; what man, that eſtimates things according to their reality, rather than their appearance, would not prefer* HEALTH TO RICHES: or thus, *if he had it in his option, would not rather chuſe* HEALTH THAN RICHES; or, *would not chuſe* HEALTH BEFORE RICHES. The three ſeveral expreſſions will be eaſily diſtinguiſhed, though wrote all in the ſame mannner, N° 26.

RULE VI. The ſubſtantive point, placed before a ſingle conſonant

consonant mark, denotes, that the substantive represented by it is to be repeated, with some intervening preposition, as *after*, *to*, *by*; as for example, *day after day*, *time to time*, N° 27.

RULE VII. The substantive, adjective, or adverb point, placed before two or more consonant marks joined together, denotes two or more substantives, adjectives, or adverbs respectively, of which those marks are the first consonants, and also that they are connected by a conjunction.

As for example, *Our blessed* LORD AND SAVIOUR *Jesus Christ, by his* DEATH AND PASSION, *made a sufficient* SATISFACTION AND ATONEMENT *for the sins of the whole world*;—*Lord and Saviour, death and passion, satisfaction and atonement*, being wrote as in N° 28.

Or further, *The precepts both of* NATURAL AND REVEALED *religion forbid us to do our neighbours any injury*; example first, N° 29. Here the point shows, that both *n* and *r* are adjectives; and the word *religion*, to which they are connected, will immediately suggest the words *natural and revealed*.

Or, to add one other instance, *What doth the Lord thy God require of thee, but to live* SOBERLY, RIGHTEOUSLY, AND GODLY, *in this present world?* example second, N° 29. Here it appears, by the prefixed point, that *s*, *r*, and *g*, must all be adverbs, and consequently that there is nearly as much expressed as if the same sentence had been written in longhand after this manner, viz. *What doth the Lord thy God require of thee, but to live s——ly, r——ly, and g——ly in this present world?* which surely would give very little trouble to fill up with the words *soberly, righteously, and godly.*

Thus any series of substantives, adjectives, or adverbs, may be expressed by their first consonants joined together with the proper point prefixed. But we must not indulge ourselves in doing this at all adventures. It is only to be done in such instances, wherein the commonness of the phrase, or the nature of the subject, points out the words signified by those letters; or when the words, so briefly described, are such, that no other can be inserted in their stead consistently with the sense of the passage.

When great dispatch is required, as in the case of following a speaker, all omissions are allowable, which can afterwards be supplied by a careful attention to the idiom of the language, and to the connection of the contracted words with those which precede or follow them. And it may not be improper to observe, that greater or less liberties of contracting may be taken, in proportion as the speaker is more or less accurate in his language. For it is certain, that any contractions, where the style is clear and regular, may be more easily decyphered, than where it is confused and embarrassed. It may happen, indeed, sometimes, that the words signified by such contractions will not occur at first sight; but a little thought will discover them; and the reader will find, that an attention of this sort will very agreeably and insensibly lead him into a more perfect knowledge of the idiom of his own language.

RULE VIII Many long words may be, and frequently are, expressed in common writing by their first syllable only, with a mark to shew that something is wanting, as *mult——* for *multitude*, *cor——* for *correspondence*. So in shorthand, long words, especially those in which the marks for the consonants will not join neatly, may be denoted by their first syllable, with as many points annexed as there are syllables wanting; as, *multitude, correspondence* *, N° 30. And when great dispatch is required, the points may be omitted, especially if the words do not begin with prepositions; as, *signification, difficulty, negligence*, N° 31.

RULE IX. The power given to the consonant-marks of representing prepositions and terminations, will enable us to write great numbers of long words after a very expeditious manner: for words beginning with prepositions may be denoted by their respective prepositions, together with the next consonant and vowel; and oftentimes with the next consonant only, adding to it the substantive, adjective, or adverb point, when necessary. As for instance, the first example, N° 32. expresses a word beginning with the two syllables *de-li*; and though there are many words which begin with those syllables, as *deliberate, deliver, delicious*, &c. yet if such a sentence as the following were to be written thus, *He was not hasty in his resolution, but took time to deli—— about it*, the word *deliberate* would immediately occur to every one.

The trouble of inserting the vowel may, in many instances, be saved, by beginning the consonant from that point after the preposition in which that vowel should be placed; as in example second, N° 32. the *m* beginning from the *u*'s place after the *t* shows, that the next vowel after *m* is *u*; and the mark therefore is equivalent to *transmu——*, which is a sufficient description of the word *transmutation*.

A few examples more will sufficiently explain this rule: as, *recommend, recommendation, recommendatory*, N° 33. *resignation, resolution, consanguinity*, N° 34. *conveniently, superficially*, N° 35.

The participles may be abbreviated after the same manner, by adding, instead of the points, the termination *ing* or *ed* to the latter consonant mark; as *consi——ing* for *considering*, *consi——ed* for *considered*, N° 36.

Words beginning with double or treble propositions may be written after the same manner; as, *misinformation, representation, misrepresentation*, N° 37. *incomprehensibility*, example first, N° 38. The prepositions must always be joined together; and, if two consonants begin the next syllable, the writing of them both will help to discover the remainder of the word; as *misunderstanding*, example second, N° 38.

It must appear plainly to every one, upon the least consideration, that the words in the foregoing instances are abbreviated. There can therefore be no danger of mistaking, for example, the mark N° 39. for some short word, such as *daily*, *duly*, &c. For, by our rule, the *d* disjoined always signifies the preposition *de*: nor can it be a word consisting of the preposition *de* and the syllable *li* or *ly* only; for, if such a word had occurred, it would have been sooner written by joining the marks together, as N° 40. This way of writing therefore shows, that the word begins with the preposition *de*; that the next syllable is *li*; and that there are some other syllable, or syllables, wanting to complete it. Nor can the consonants in those examples in which the vowels were omitted, be mistaken for terminations; as in this example, N° 41. the *k* cannot be supposed to represent the termination *ical*; since it would be absurd to think of describing any word by its preposition and termination only: for as the same

* When one syllable only is wanting, a point cannot be used to express it; for a point so placed must denote a vowel.

ſame prepoſition and termination are common to great numbers of words, they alone can never give a good deſcription of any particular one.

This way of reaſoning purſued will lead to the diſcovery of an eaſy and ſhort method of denoting the words *ſelf* and *ſelves*, which ſo frequently follow the pronouns. For, if a disjoined mark loſes its power of repreſenting a termination, by being placed cloſe after a prepoſition, the — muſt certainly loſe that of repreſenting *ſion* or *tion*, when placed cloſe after any of the pronouns, ſince they never admit of ſuch a termination. It muſt therefore, in that ſituation, denote only the conſonant *s* followed by that vowel from whoſe place in the line it is drawn; and conſequently the words *ſelf* and *ſelves* may be very commodiouſly repreſented by drawing the *s* from the *e*'s place, cloſe after any of the pronouns; as, *myſelf*, *itſelf*, *ourſelves*, *themſelves*, &c. N° 42. And though the word *own* ſhould intervene, yet *ſelf* or *ſelves* may ſtill be ſignified in the ſame manner; as, *my own ſelf*, *his own ſelf*, &c. N° 43.

The words *what*, *who*, *whom*, *how*, &c. have very often the word *ſoever* added to them, which may, for a reaſon ſimilar to the foregoing, be very aptly expreſſed by the *s* drawn from the place of *o*; as *whatſoever*, *howſoever*, *whomſoever*, &c. N° 44.

Rule X. In like manner, words ending in any of the terminations marked in the preceding table of the alphabet, may be denoted by their firſt conſonant and vowel, together with the proper mark for its termination; as for example, *ar——ry* for *arbitrary*, *op——ity* for *opportunity*, *cu——ity* for *curioſity*, *lawfulneſs*, N° 45.

But it muſt be carefully obſerved, that the vowel, whether it precedes or follows the conſonant, muſt never be omitted; otherwiſe the conſonant might be taken for a prepoſition, and then this rule would interfere with the foregoing: whereas its power of repreſenting a prepoſition is deſtroyed by the addition of the vowel, whilſt the ſingle diſjoined mark, at the end, retains its power of repreſenting a termination. The word is therefore deſcribed by its beginning and termination, a vacancy being left in the middle to be ſupplied by the ſagacity of the reader.

Rule XI. It cannot have eſcaped the obſervation of any one who has conſidered the Engliſh language with any degree of attention, that words of different ſignifications govern, or require different prepoſitions; that words, for example, ſignifying *deſire*, *knowledge*, *ignorance*, &c. require the prepoſition *of*; that other words, importing *mercy*, *compaſſion*, *dependence*, &c. require the prepoſition *upon*, *&c.* Care therefore being taken to write the prepoſitions plainly, the firſt conſonant only will in many inſtances be found to be ſufficiently deſcriptive of the words which require thoſe particular prepoſitions. For although there may be many words which begin with the ſame conſonant; yet all thoſe which do not require that particular prepoſition, are upon that account immediately excluded; and the remainder is by that means reduced to ſo few, that it will be eaſy to ſelect the proper one. In every one of the following ſentences (and many more of the like kind might be given) the letter *d* denotes a different word, *viz.* in *He was very d—— of being thought rich*; *You may d—— upon my promiſe*; *I d—— from him in opinion*; *He d—— long about the choice of a patron, but at laſt reſolved to d—— his work to*, &c. &c. and yet, by the help of the diſcriminating prepoſitions, the particular word proper to each place is eaſily diſcoverable.

A few inſtances will be ſufficient to give the learner a right notion of this method of abbreviation.

For example, in the following ſentences; *This* BELONGS *to me*; *He made ſome good* OBSERVATIONS *upon it*; *I want to* DISPOSE *of my houſe*; *He* AGREED *with me in opinion*;—the words *belongs*, *obſervations*, *diſpoſe*, *agreed*, may be written as in N° 46. And in theſe ſentences, *There was not the leaſt* DIFFERENCE *between us*; *We muſt take particular care to* GUARD *againſt ſuch paſſions as we find ourſelves moſt* LIABLE *to*; *As for his perſonal eſtate, he* DIVIDED *it amongſt all his children in equal ſhares*;—the words *difference*, *guard*, *liable*, and *divided*, may be wrote as in N° 47.

And it may be further obſerved, that as few Engliſh words end with the ſyllable *to*, the propoſition *to* may for that reaſon be joined to the preceding word, which was directed to be ſignified by its firſt conſonant only. For the unuſualneſs of the ending will be a ſufficient hint, that the mark repreſents not one, but two words; and, therefore, *This belongs to me*, may be written as in example firſt, N° 48. and *liable to*, *ſatisfactory to*, and *ſubject to*, may be wrote as in the ſecond, third, and fourth examples, the — in this laſt inſtance being made at the bottom of the line, to ſhow that the vowel following it is *u*. But, if any one finds it difficult to write the *t* upwards, he may, whenever it is neceſſary, diſtinguiſh the two laſt inſtances from one another, by inſerting the *u*, and write *ſubject to* as in N° 49.

Other prepoſitions, which are denoted in the table of the alphabet by a ſingle conſonant, may, in like manner, be joined to the preceding word; as in the example, *He made ſome good obſervations upon it*,—*obſervations upon* may be written as in N° 50. Nor will there be any great danger of the reader's being puzzled by miſtaking ſuch like marks for ſingle words; for it will not often happen that the two conſonants of which they are compoſed will form any word, ſcarcely ever that they will form ſuch a word as will ſuit the place and agree with the context. A little cuſtom will therefore ſoon ſuggeſt to the learner, that the two marks muſt denote two words; the latter of which, being repreſented in his ſhort-hand alphabet by the latter conſonant mark, muſt for that reaſon immediately occur to him.

Rule XII. Prepoſitions generally require after them either a noun, or a pronoun. The pronouns being few in number, and in all languages uſed as ſubſtitutes for nouns, muſt occur very frequently, and by that means ſoon become familiar to the learner; the pronoun, for that reaſon, may be joined to the prepoſition, without danger of creating any difficulty to the reader.

As for example, in theſe ſentences, *He gave it to me*, *He left it to my*, *to us*, *to you*, *to our*, *to your*, the words *to me*, *to my*, *to us*, *to you*, *to our*, *to your*, may be wrote as in N° 51. The *h*, *th*, or *wh*, may, for the ſake of joining, be dropped in the pronouns, which begin with thoſe letters, as *his*, *this*, *whom*, &c. and we may write *to his* as in example firſt, N° 52. and *to this* as in example ſecond; diſtinguiſhing, if it ever ſhould be thought neceſſary, *his* from *this*, by the different ſituation of the point; *to her* and *to their*, as in example third: for a diſtinction between them can not be made, as was done in the inſtance before, by the different placing of the point; but the ſenſe of the paſſage will eaſily ſhow which it muſt be. *To whom*, *to thoſe*, or *to whoſe*, *to which*, *to each*, may be wrote as in the firſt four examples, N° 53. *It was not* IN MY *power*; *in my*, as in the

the fifth example. *It was thrown* UNDER MY *feet*, *He came and dwelt* AMONGST US, *You may be depend* UPON ME; the words *under my*, *amongst us*, *upon me*, as in N° 54.

This rule is not to be restrained to those prepositions only which are denoted in the table of the alphabet by a single consonant, as *among*, *under*, *upon*, &c. but may be extended to others, which must in that case be represented by their first consonant, and be joined to the pronoun; as, *he did it* WITH MY *consent*, writing *with my* as in N° 55. This will occasion no ambiguity, since *w* cannot in this place signify the word *will;* for such a sentence as, *he did it will my consent*, would be neither sense nor grammar. Its situation in the sentence, and connection with the pronominal adjective *my*, plainly mark that it must be some preposition which begins with *w*.

And though several prepositions should begin with the same consonant, yet they may be written in this manner, provided that the preceding or following words be such as will serve to distinguish them, and shew which of them must needs there be meant; as in the following examples: *He came privately and took it away* WITHOUT MY *knowledge*; *To stoop to so mean an action was much* BENEATH HIS *dignity*; *It is* BEYOND MY *reach*. *Without my* may be written as *with my*, N° 55. and the words *beneath his*, *beyond my*, as in N° 56. *Above* may be distinguished from *beyond*, by prefixing the initial vowel. Thus, in the following sentence, *it is* ABOVE MY *comprehension*, *above my* may be wrote as in example first, N° 57. and *between them*, *before my*, *behind my*, in these sentences, *They divided it equally* BETWEEN THEM, *He had the impudence to do it* BEFORE MY *face*, *He did it slyly* BEHIND MY *back*, may be wrote as in the three last examples, N° 57.

But it is to be noted here, that when the propositions themselves are abbreviated, as in these instances above, they cannot help to explain other words, as they did in those mentioned in the beginning of the 11th Rule, in which they were directed to be written plainly; for it would be very puzzling indeed, if that word, which was to assist in explaining others, wanted explanation itself.

RULE XIII. After the learner has, by a little practice, made the last method of abbreviation familiar to himself, he may venture to combine it with the foregoing, and join the preceding word, the preposition, and pronoun all together: and as he had learned before to write *belongs to*, as in example first, N° 58. and as the last rule taught him to write *to me* as in example second, he may now join them all together, and write *belongs to me*, *extends to us*, *agreed with me*, *depend upon me*, as in N° 59.; *observations upon this*, as in example first, N° 60.; and *rebellion against his*, *dissensions amongst his*, as in the two following sentences, *He was a notorious traitor and caught in actual* REBELLION AGAINST HIS *Majesty*, *He was an ill natured man, and always endeavouring to sow* DISSENSIONS AMONGST HIS *neighbours*, may be wrote as in N° 60.

When a pronoun, or a preposition and pronoun, follow the verb, and are themselves followed by a preposition and pronominal adjective, they may all be joined together; as, *I* CONGRATULATED HIM UPON HIS, *&c. I* CONDOLED WITH HIM UPON HIS, N° 61.

The words *some*, *any*, *none*, *which*, *each*, *both*, &c. followed by a preposition and pronoun, may, agreeably to this rule, be denoted by their first consonants, and be joined to the preposition and pronoun; as, *some of them*, *any of us*, *none of them*, N° 62. *both of them*, *which of them*, *each of them*, N° 63. The first dot is inserted to distinguish the words from one another which begin with the same consonant; as, *none*, *any*, &c. The latter dot must never be omitted, as it is the appointed way of writing the pronouns when joined to prepositions; as, *of them*, N° 64.

RULE XIV. After the learner has for some time accustomed himself to the foregoing rule, he may advance a step further, and join the adverbs preceding the verbs, and the substantives following the pronominal adjectives, to the verbs and adjectives respectively, denoting both the adverbs and substantives by their first consonants, or at most by their first consonants and vowels; as for example, in this sentence, *you may* SAFELY DEPEND UPON MY WORD, *safely depend upon my word* may stand as in N° 65. *

Difficult as this may seem to a beginner, yet habit, and a little reflection upon the nature of our language, will quickly render it easy to him. His own experience will soon convince him, that contractions, when judiciously made, may be more certainly and easily read than the unexperienced are apt to imagine. It may, perhaps, for a while at the first, be a good method to take the contractions to pieces, writing in long-hand exactly what is given in short-hand. The foregoing contraction so transcribed would stand thus, *you may sa—— d—— upon my w——*. Here the preposition *upon* will soon suggest, that the preceding word, beginning with the consonant *d*, must be *depend*; and the word denoted by its initial letters *sa*, coming betwixt the auxiliary *may*, and the verb *depend*, is by its situation, according to the usual arrangement of words in our language, plainly enough marked to be an adverb; so that it is nearly the same as if it had been written thus, *You may sa——ly depend upon my w——*, which is too plain a description to prove a stumbling-block to any attentive reader.

RULE XV. Many common phrases, formed by a substantive preceded by the prepositions *with*, *without*, *in*, &c. and followed by *to*, *of*, &c. may be very conveniently contracted; as, *with regard*, *respect*, *or reference to*, N° 66. example first. *He basely broke his promise*, WITHOUT ANY REGARD TO HIS *honour*; *without any regard to his*, as in example second; *in relation to*, as in the third example; *in order to*, *in consequence*, *comparison*, *or consideration of*, *in obedience to your*, N° 67.; *by reason of his*, *by virtue of his*, N° 68. (in this last instance, the proportionably little *b* shows, that the mark following it is to be divided into two letters;) *upon account of*, *in the power of*, N° 69.

RULE XVI. Common adverbial phrases are, in like manner, often denoted by their initial consonants joined together; as, *for the future*, *at the same time*, *at present*, *in this manner*, N° 70.; *in like manner*, *in a great measure*, *in the same manner*, N° 71.; *in so much that*, *so much the more*, *in the mean time*, N° 72.; *in general*, *in particular*, N° 73.

And when the proportion of equality is expressed by *so——as*, or *as——as*, with some one word intervening, they may be all joined together; as, *so much as*, *as much as*, *as*

* As a substantive must necessarily follow the adjective *my*, there was no occasion to place the point at the end of the *w* to show that it was one.

as well as, as long as, as good, or as great as, &c. N° 74.

Rule XVII. The contractions which may be made when *it is* or *it was* are followed by an adjective, and *to* or *that*, are so numerous, that we must content ourselves with giving a few of the most usual; as, *it is impossible to, it was unnecessary to, it is contrary to,* N° 75.; *it is according to, it is observable that, it is evident that, it is not to be supposed that,* &c. N° 76.

The above methods of abbreviation are such as are of most common use and practice: and though they are not many in number, yet they are very extensive in their application; for a sentence can scarce occur in which some one or other of them will not find a place. But yet we are far from pretending to have exhausted the subject. An accurate and assiduous attention to the nature and idiom of our language may suggest others as useful and extensive as these. Proper care being taken to lay a right foundation, the legible ways of contracting will increase, in proportion to the writer's want of them. The more he writes, the more concisely he may venture to write, and yet be able to read his contractions with ease; provided that he builds them upon some known particularity of our language: for which reason we have been more solicitous to explain the grounds of our rules, than curious in the choice, or copious in the number of examples. But that the learner may have all the assistance necessary, we have furnished him with specimens, (Plates CLIII. CLIV. CLV.) where he will find his rules exemplified; and as the last specimen is taken from a book not in every person's possession, we have given the passage in a note *.

But it may not be amiss, before we conclude, to make a remark or two upon abbreviations in general.—First, that in all the various ways that can be taken of contracting, (that is of describing words by some shorter method than that of writing all the consonants of which they consist,) care must be taken, when the contraction consists of two or more words joined together, that no one word of it be represented by more than one character; and secondly, that the whole mark, by some means or other, if possible, be shown to be a contraction, as it has been generally done in the foregoing pages, either by the insertion of points in the middle of the marks, as N° 77. (Plate CLIII.) for *some of them*; (which, when dispatch is required, is never practised to denote vowels in the middle of words;) or by the unusual ending of the mark, as N° 78. for *liable to, appears that*; for few words (since the termination *eth*, so frequent in scripture-language, is now almost grown obsolete) end in *th*; or by the unusual joining of the marks, as, *in the, it is,* &c. N° 7. Otherwise the reader might be puzzled in hunting for some one word consisting of the letters which are written: whereas, if he knows it to be a contraction, he is not bewildered in his researches, but is at first directed the right road, and has nothing to do but to search after some word for every character, which will suit the description, and agree with the context.

And when contractions are judiciously made, the learner, provided he will observe the caution already given, (and which cannot be too often repeated,) of beginning with the easiest, and of not proceeding to a second, until the first is become familiar, will certainly find the difficulty of decyphering them lessen every day.

But, supposing that there was more difficulty in the reading

* PROCEEDINGS on an *Habeas Corpus* upon the commitment (by Sir *William Turnbul* Secretary of State) of *Kendale* and *Roe* for High Treason, 31 October 1695.---Sir *Bartholomew Shower*, for the prisoners, spoke as follows.

Sir *Bartholemew Shower*. I am of counsel for these two prisoners: and what we desire at present is only that they may be bailed; though perhaps we might press to have them discharged, and that upon good reason.

To induce your Lordship to bail them, I must beg your Lordship's pardon, and I hope Mr. Attorney will hold me excused, if I make a question, Whether the person committing hath any authority for such a purpose. It is for my clients, who think themselves aggrieved by this imprisonment: and in truth they say, that they are somewhat hardly dealt withal in this case; for the information against them is only for being privy to, and assisting the escape of the centinels who were privy to Sir James Montgomery's escape. But this is fact of which the court will not take notice; and therefore I shall confine myself to the return, as it appears before your Lordship.

With submission, I must insist upon it, that a secretary of state, *quatenus* secretary, cannot commit for treason or felony: he is not an officer for such a purpose in common parlance. The word *secretary* imports only a *writer of letters* or other escripts for a superior; and, as Spellman explains the word, this is the sense of it, with the addition of secrecy, of privacy: and so is his glossary upon that word. He is not a privy-counsellor, *quatenus* a secretary; nor is he a justice: and though perhaps, in fact, he may be in the commission; yet, unless he hath taken the oath of that office upon a *dedimus*, he cannot act as such: and I have seen five or six privy-counsellors at a time appearing at a sessions of the peace for this county, in the case of the Duke of Bedford's power, as *custos rotulorum*, to remove the clerk of the peace; and when intimation was made to them of the justices oath which they had not taken, they refused to vote, and did thereupon withdraw. Here Sir William Turnbull cannot be presumed or intended to be a justice of the peace; because the commitment by him is as secretary, and not as justice; and so is the return: and upon the return the authority by which he commits ought to appear, otherwise the return is vicious; and here doth appear none but that of a secretary. Now, if the office of secretary doth not imply and carry in it a power of committing, then this committment is erroneous.

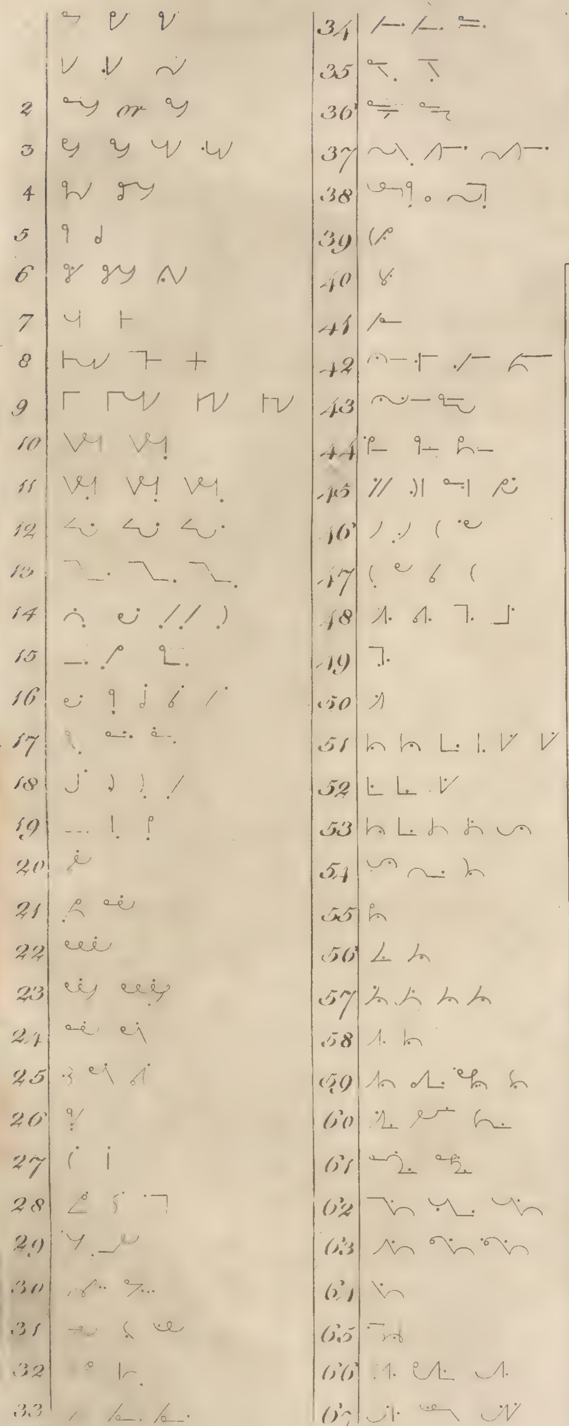
Our constitution hath distributed the administration of justice, both in criminal and civil causes, into several courts; and hath appointed several officers for several purposes; some for civil, some for criminal matters; and in criminals some are to examine and commit, others to obey and carry, others to receive and keep; some to try and sentence, others to execute; each hath his proper province: and of those your Lordship will take notice, as also of their several duties and powers; and so do our law-books. But a secretary is a court-officer of state, not relating to the administration of justice.

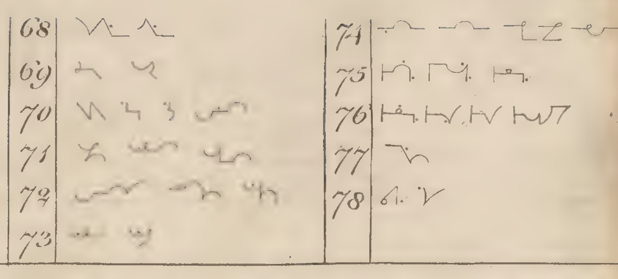
You take notice, as do our books, of head-boroughs, constables, sheriffs, coroners, escheaters, and the like: But neither *Coke, Crompton, Fitzherbert, Smith*, or any book which treats of the jurisdiction of courts, the pleas of the crown, or the officers of justice, do ever mention a secretary of state: his office rather relates to foreign negotiations than domestick; and if any home-affairs fall under his cognizance, it is rather as an intelligencer than with any relation to criminals, prisons, or gaolers, &c. In all the debates about the liberty of the subjects, and wrongful commitments, which were in parliament in 4 *Car.* I. or 1628; and amongst all the precedents mentioned there upon each side, which are multitudes; there is none by a secretary. It is true, there are divers *per mandatum Dom. Regis*, by warrant from the Lords of the council. I have perused Dr. *Franklin*'s Annals of King James the 1st. *fol.* 261. and *Rushworth*, Vol. I. 458. and can find none by a warrant from a secretary. I have read *Coke*'s, *Selden*'s, and *Littleton*'s arguments upon that subject, but see nothing of a secretary's commitment. And it seems very strange, if such a power were lodged in this state-officer, that there should be no precedents for it in those times, when extrajudicial and general warrants were so frequent, that they became a grievance to the people, and such a one as laid the foundation for the *petition of rights*.

I shall not controvert the power of the council at present, because it doth not concern the present question: All that I can observe in the case is, that it first began to be practised in Sir Lionel Jenkyns's time; and yet, even in 1678, when the Popish plot had increased the number of prisoners to a wonderful degree, it is notoriously known, that the chief justice Scroggs was frequently and often sent for to Whitehall, to examine, and commit, and grant warrants. And sometime since the secretaries of state have thrown that burden off from themselves upon their secretaries under them, who have been sworn justices of the peace; and Mr. Bridgeman hath accordingly executed the office of a justice of peace at Whitehall, and that frequently. It hath been a question, Whether a chancellor, or keeper of the great seal, can commit; and the better opinion hath been, that he cannot: And it seems to be agreed by *Granvill*'s and other cases in *Moor*'s Reports, 839. &c. that his commitment is illegal, unless for a cause within his jurisdiction as a court of equity: and the matters must so appear. I must agree, that any man may apprehend another for felony or treason; but there is a vast difference between an arresting of a traitor or felon upon suspicion or knowledge, and a formal commitment to prison with a charge of treason. And I am sure Mr. Attorney General will not insist upon this reason; for then the consequence will be, that any man may commit, as well as a secretary: And I suppose that doctrine will scarce be allowed; though I think that any man may, as well as he. The reason of an apprehension upon suspicion, or hue and cry, or the like, is not to detain, but to carry to a constable or justice, as in 3. *inst.* 52. Then here the goaler doth not return that he detains him because he is guilty or suspected; but because, by virtue of such a warrant, he is committed to his custody.

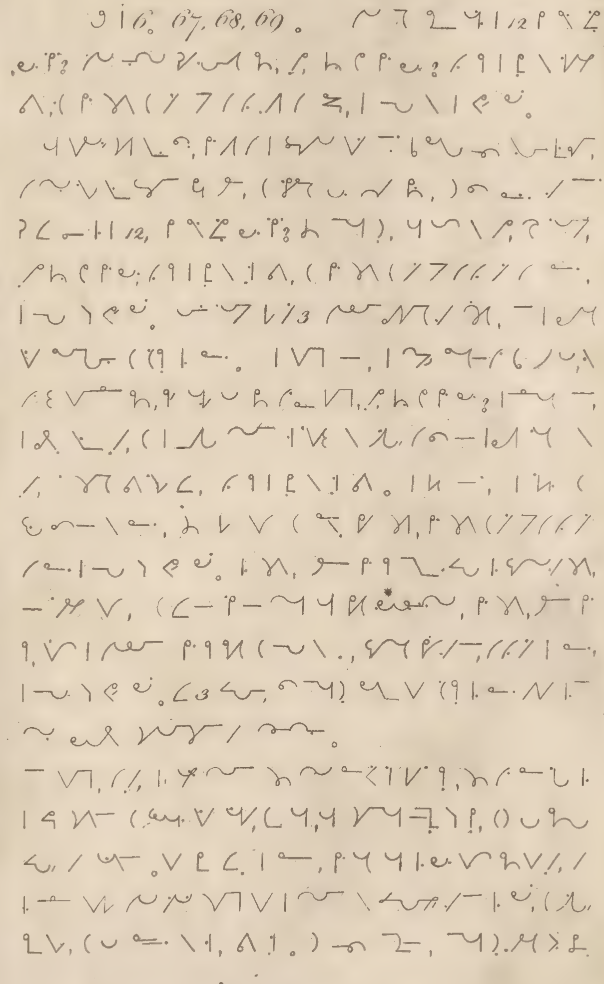
Besides, the reason of our law is against it; for a secretary cannot administer an oath. Now the law requires, that no man should be committed by an extrajudicial warrant, unless upon oath. If there be but a suspicion, there ought to be oath of the cause of that suspicion; for the person committing cannot commit upon another's suspicion, unless there be oath of some reasonable cause for it. He cannot take bail for any person accused, he cannot take a recognizance to prosecute. And I may very well challenge any man living to shew me any one recognizance ever returned into any court, that was taken by a secretary, either for appearance of a criminal, or for the prosecution of one. And the practice is always otherwise; for they have often taken bonds to the king with condition to appear here. And your Lordship, and the court, hath often had much trouble in that matter; for, they being bound to appear here, the court hath refused to record their appearance, because no recognizance returned or taken whereupon to found such an appearance.

Now it seems strange, nay absurd, that our constitution, which we admire for its wisdom, should appoint an officer who would commit, and yet cannot give an oath whereon to found a commitment, that cannot bail, that cannot take any recognizance to prosecute: This is to make the liberty of the subject very precarious, notwithstanding the many laws and sayings of judges in favour of it, &c. STATE TRIALS, Vol. V. Page 605.





Part of Dr. Sherlock Bp. of London's 1st Sermon with a few of the most common Contractions.



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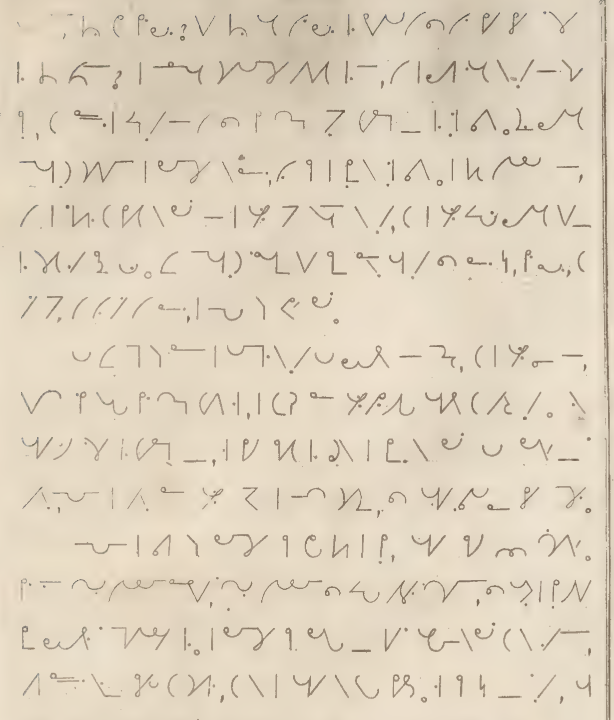
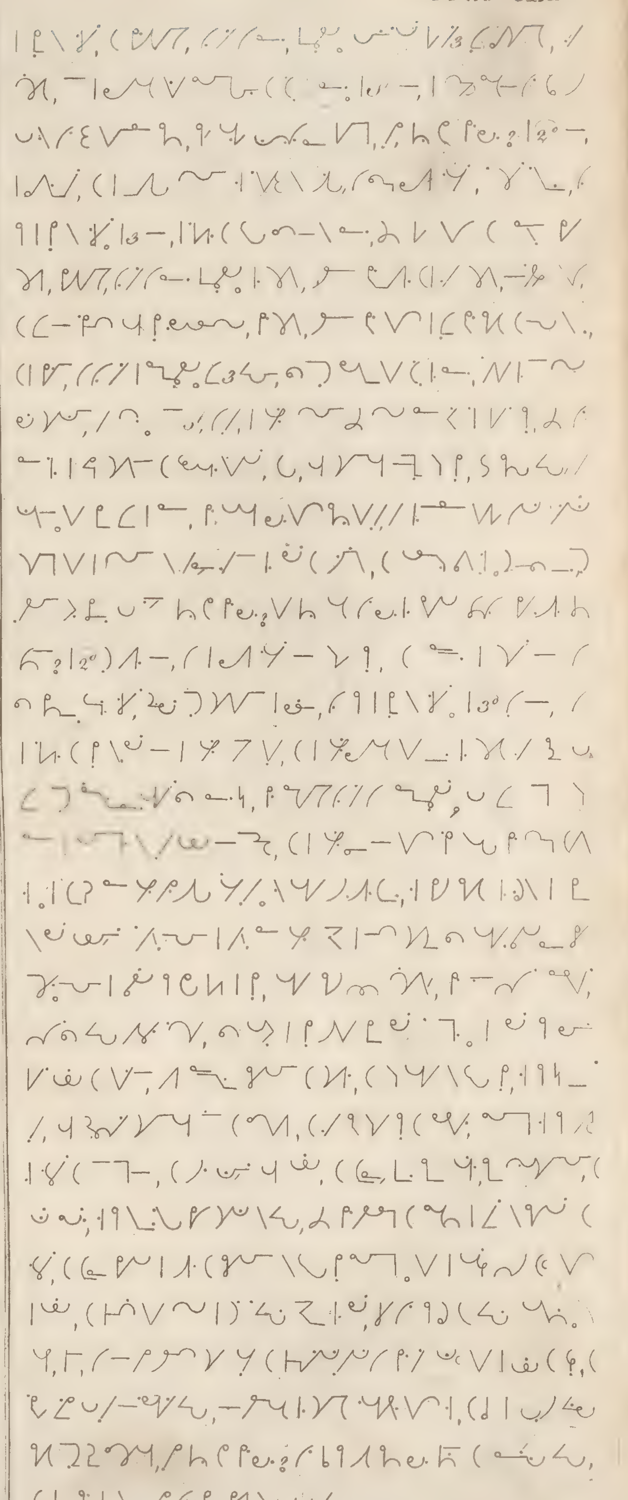
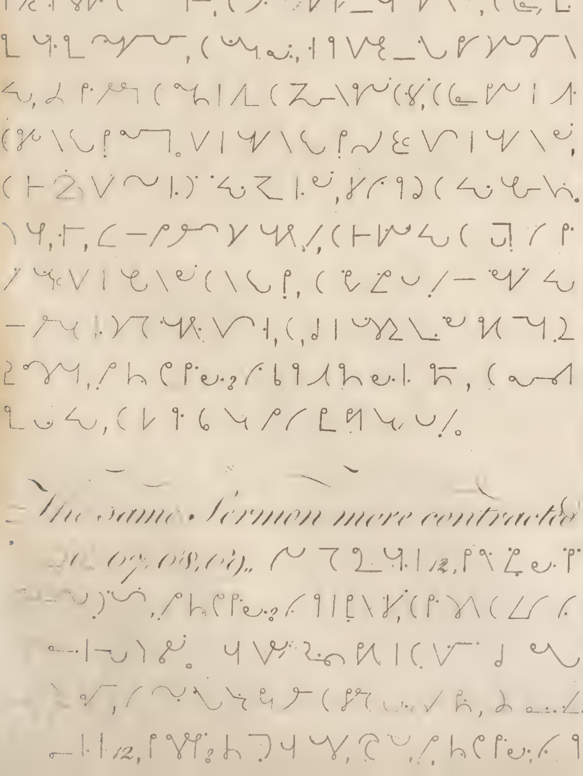
J.B.S.





The same Sermon more contracted



State Trials. Vol. v. Page 605.

Proceedings on an Habeas Corpus upon the Commitment by Sr. W. Trumbull Secretary of State of Kendal and Roe for high Treason

Sr. Bart. Shower:

J. Bell sc.

ing of them; yet, provided that they may be certainly made out by due attention to the ſubject treated upon, and the idiom of the language, it will be ſufficient: for the learner muſt be advertiſed, that theſe contractions are not deſigned to be taught as the common ſtandard method of writing ſhort-hand upon all occaſions.—That method which was taught in the firſt part, and which will be as eaſily read, upon a little practice, as common long-hand, will be found ſufficiently ſhort for all common purpoſes; and it ſhould therefore be kept to when very great diſpatch is not required.

Inventors of ſhort-hand have generally introduced into their ſyſtems a multitude of *arbitrary* marks, to ſignify particular words and phraſes, which are often choſen rather upon account of their length than their frequent occurrence. The injudicious application of theſe arbitrary marks is not the only objection againſt them. They are not only burdenſome to the memory, and tedious and difficult to be learned, but are forgot even by the writer himſelf, unleſs he ſits down to decypher immediately whilſt every thing is freſh in his memory.

Theſe objections lie not againſt the above methods of abbreviation. They burden the memory with no new and arbitrary marks, and with but few rules for the extenſion of the powers of the alphabetical characters; and the rules are ſo general, and applicable to ſuch a multitude of caſes perpetually occurring, that they give this ſyſtem the advantage, even in point of expedition, over arbitrary marks, and at the ſame time leave the writing legible, whatever length of time intervenes, not only to the writer himſelf, but alſo to every fellow-practiſer of the ſame method.

SHOT, a denomination given to all ſorts of balls for fire-arms; thoſe for cannon being of iron, and thoſe for guns, piſtols, *&c.* of lead.

SHOVELER, in ornithology. See ANAS.

SHOULDER BONE, in anatomy. See ANATOMY, p. 175.

SHOULDER-BLADE. See ANATOMY, p. 176.

SHOWER, in meteorology, a cloud reſolved into rain. See RAIN.

SHREW-MOUSE. See MUS.

SHREWSBURY, the county-town of Shropſhire, ſituated on the river Severn: W. long. 2° 46′, N. lat. 52° 46′. It ſends two members to parliament.

SHRIMP, in ichthyology. See SQUILLA.

SHRINE, in ecleſiaſtical hiſtory, a caſe or box, to hold the relics of ſome ſaint.

SHROPSHIRE, a county of England, bounded by Cheſhire on the north, by Staffordſhire on the eaſt, by Herefordſhire on the ſouth, and by Montgomeryſhire on the weſt.

SHROVE-TUESDAY, is the Tueſday after Quinquageſima Sunday, or the day immediately preceding the firſt of Lent; being ſo called from the Saxon word *ſhrive*, which ſignifies *to confeſs*, as having been employed by the people in time of popery, in confeſſing their ſins, in order to receive the ſacrament, and thereby qualify themſelves for a more religious obſervation of Lent.

SHROWDS, in a ſhip, are the great ropes which come down both ſides of the maſts, and are faſtened below to the chains on the ſhip's ſide, and aloft to the top of the maſt; being parcelled and ſerved in order to prevent the maſt's galling them. The top-maſt ſhrowds are faſtened to the puttock-plates, by dead eyes and laniards, as the others are.

SHRUB, among naturaliſts, denotes a dwarf-tree, or a woody plant leſs than a tree; ſuch are holly, box, privet, *&c.*

SHUTTLE, in the manufactures, an inſtrument much uſed by weavers, in the middle of which is an eye, or cavity, wherein is incloſed the ſpoul with the woof

SI, in muſick, a ſeventh note or ſound, added by Le Maire to the ſix ancient notes invented by Guido Aretine, *viz. ut, re, mi, fa, ſol, la, ſi.*

SIAM, the capital of a kingdom of the ſame name, in the further peninſula of India: E. long. 101°, N. lat. 14°.

SIBA, a province of the hither India, ſituated between Tibet on the eaſt, and Labor on the weſt.

SIBALDIA, in botany, a genus of the pentandria pentagynia claſs. The calix conſiſts of ten ſegments, and the corolla of five petals inſerted into the calix; the ſtyli are placed on the ſide of the germen; and there are five ſeeds. The ſpecies are two, only one of them, *viz.* the procumbens, or baſtard cinquefoil, a native of Britain.

SIBERIA, or ASIATIC RUSSIA, the moſt northern country of Aſia, ſituated between 60° and 130° E. long. and between 47° and 72° N. lat. being upwards of two thouſand miles in length from eaſt to weſt, and one thouſand five hundred miles in breadth from north to ſouth. We include the Calmuc Tartars within the limits of Siberia, as they acknowledge themſelves ſubject to the empire of Ruſſia.

SIBTHORPIA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five ſegments, and the corolla of five equal ones; the pairs of ſtamina are remote; the capſule is compreſſed, globular, and has two cells, with a tranſverſe diſſepimentum.

SIBYLS, in pagan antiquity, certain women ſaid to have been endowed with a prophetic ſpirit, and to have delivered oracles foreſhewing the fates and revolutions of kingdoms, *&c.*

The moſt eminent of the ten ſibyls mentioned by ancient writers, was ſhe whom the Romans called the Cumæan or Erythræan ſibyl, from her being born at Erythræ in Ionia, and removing from thence to Cumæ in Italy, where ſhe delivered all her oracles from a cave dug out of the main rock, according to Virgil, Æn. III. 441, *&c.*

There is ſtill preſerved, in eight books of Greek verſes, a collection of verſes pretended to have been delivered by the ſibyls; but the generality of critics look upon it as ſpurious: and it is the opinion of Prideaux, that the ſtory of the three books of the ſibyls, ſold to Tarquin, was a ſtate-trick or fetch of politics.

SICILY, the largeſt of all the Italian iſlands, anciently called Trinacria, from its triangular figure: it is ſituated between 12° and 16° E. long. and between 37° and 39° N. lat. being about one hundred and ſeventy miles long, and one hundred broad.

It is separated from Calabria, in Italy, by the ſtraights of Meſſina, which, in the narroweſt part, is not ſeven miles over.

SICYOS, in botany, a genus of the monœcia ſyngeneſia claſs. The calix and corolla of the male have each five ſegments; and there are three filaments; the calix and corolla of the female are the ſame with thoſe of the male; the ſtylus is trifid; and the drupa contains one ſeed. There are two ſpecies, none of them natives of Britain.

SIDA, in botany, a genus of the monadelphia polyandria claſs. The calix is ſimple and angular; the ſtylus is divided into many parts; and there are many capſules, each containing one ſeed. There are 23 ſpecies, none of them natives of Britain.

SIDEREAL YEAR. See ASTRONOMY, p. 458.

SIDERIA, in natural hiſtory, the name of a genus of cryſtals, uſed to expreſs thoſe altered in their figure by particles of iron. Theſe are of a rhomboidal form, and compoſed only of ſix planes. Of this genus there are four known ſpecies: 1. A colourleſs, pellucid, and thin one, found in conſiderable quantities among the iron ores of the foreſt of Dean in Glouceſterſhire, and in other the like places. 2. A dull, thick, and brown one, not uncommon in the ſame places with the former. And, 3. A black and very gloſſy kind, a foſſil of very great beauty, found in the ſame place with the others, as alſo in Leiceſterſhire and Suſſex.

SIDERITIS, in botany, a genus of the didynamia gymnoſpermia claſs. The ſtamina are within the tube of the corolla; and there is a ſhort ſtigma over-lopping another one. The ſpecies are eleven, none of them natives of Britain.

SIDEROXYLUM, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of ten ſegments alternated crooked inwards; the ſtigma is ſimple; and the berry contains five ſeeds. There are three ſpecies, none of them natives of Britain.

SIDMOUTH, a port-town of Devonſhire, ſituated on a bay of the Engliſh channel, ten miles ſouth-eaſt of Exeter.

SIDON, or SAYD, a port-town of Paleſtine, in Aſiatic Turky, ſeventy miles north of Jeruſalem. It is ſtill a place of ſome conſideration, being the reſidence of a Turkiſh baſhaw.

SIDRA, an iſland of the Archipelago, ſituated at the entrance of the gulph of Napoli.

SIEGE, in the art of war, the encampment of an army before a fortified place, with a deſign to take it.

SIENNA, a city of Italy, in the duchy of Tuſcany, ſituated thirty-ſix miles ſouth of Florence.

SIERRA LEON, a river of Guinea, which falls into the Atlantic ocean, in W. long. 14°, and N. lat. 7°.

SIEUR, a title of reſpect among the French, like *maſter* among us: it is much uſed by the lawyers, as alſo by ſuperiors in their letters to inferiors.

SIGAN, a town of China, in the province of Xenſi: E. long. 108°, and N. lat. 34°.

SIGESBECKIA, in botany, a plant of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is paleaceous; it has no pappus; the involucrum has five leaves; and the radius is dimidiated. There are two ſpecies, none of them natives of Britain.

SIGETH, a town of lower Hungary, ſituated ſeventy-three miles ſouth-weſt of Buda, and ſubject to the houſe of Auſtria.

SIGHT, or VISION. See OPTICS.

SIGISTAN, the capital of a province of the ſame name, in Perſia: E. long. 62°, and N. lat. 31°.

SIGN, in general, the mark or character of ſomething abſent or inviſible.

Among phyſicians, the term ſign denotes ſome appearance in the human body, which ſerves to indicate or point out the condition of the patient, with regard to health or diſeaſes.

SIGN, in algebra. See ALGEBRA, p. 80.

SIGN, in aſtronomy. See ASTRONOMY, p. 435.

SIGNATURE, a ſigning of a perſon's name at the bottom of an act or deed, wrote by his own hand.

SIGNATURE, in Scots law. See LAW, Tit. xii. 24.

SIGNATURE, in printing, is a letter put at the bottom of the firſt page at leaſt, in each ſheet, as a direction to the binder in folding, gathering, and collating them. The ſignatures conſiſt of the capital letters of the alphabet, which change in every ſheet: if there be more ſheets than letters in the alphabet, to the capital letter is added a ſmall one of the ſame ſort, as A a, B b; which are repeated as often as neceſſary. In large volumes it is uſual to diſtinguiſh the number of alphabets after the firſt three or four, by placing a figure before the ſignature, as 5 B, 6 B, *&c.*

SIGNET, one of the king's ſeals, made uſe of in ſealing his private letters, and all grants that paſs by bill ſigned under his majeſty's hand: it is always in the cuſtody of the ſecretaries of ſtate.

SIGNET, in Scots law. See LAW, Tit. iii. 16.

SILENE, in botany, a genus of the decandria trigynia claſs. The calix is ventricoſe; the corolla conſiſts of five unguiculated petals; and the capſule has three cells. There are 34 ſpecies, 6 of them natives of Britain.

SILESIA, a duchy belonging to the king of Pruſſia, two hundred miles long, and ſeventy broad: it is bounded by Brandenburgh on the north, by Poland on the eaſt, by Hungary on the ſouth, and by Moravia and Bohemia on the weſt.

SILESIAN EARTH, in the materia medica, a fine aſtringent bole. It is very heavy, of a firm compact texture, and in colour of a browniſh yellow. It breaks eaſily between the fingers, and does not ſtain the hands; is naturally of a ſmooth ſurface, and is readily diffuſible in water, and melts freely into a butter-like ſubſtance in the mouth. It leaves no grittineſs between the teeth, and does not ferment with acid menſtrua. It is found in the perpendicular fiſſures of rocks near the gold-mines at Strigonium in Hungary, and is ſuppoſed to be impregnated with the ſulphur of that metal. It is a good aſtringent, and better than moſt of the boles in uſe.

SILIQUA, a term uſed by botaniſts to denote a pod.

SILIQUA. See BOTANY, p. 637.

SILK, is properly an animal fluid, hardened by the air; being an extremely ſoft and gloſſy thread, ſpun by the ſilk-worm, the body of which conſiſts of eleven rings.

The humours found in the body of this inſect approach to the nature of ſilk; ſince, on being rubbed in the hand, they leave a ſolid cruſt behind. In the ſides of the belly, all about the ventricle, there are depoſited a vaſt number of veſſels, which contain the ſilky juice: theſe run with various windings and meanders to the mouth; and are ſo

difpofed, that the creatures can difcharge their contents at pleafure at the mouth; and, according to the nature of the juices that they are fupplied with, furnifh different forts of filk from them, all the fluid contents of thefe veffels hardening in the air into that fort of thread that we find the web or balls of this creature confift of.

As foon as the filk-worm is arrived at the fize and ftrength neceffary for beginning his cod, he makes his web; for it is thus they call that flight tiffue which is the beginning and ground of this admirable work. This is his firft day's employment. On the fecond he forms his folliculus or ball, and covers himfelf almoft over with filk. The third day he is quite hid; and the following days employs himfelf in thickening and ftrengthening his ball; always working from one fingle end, which he never breaks by his own fault; and which is fo fine, and fo long, that thofe who have examined it attentively think they fpeak within compafs, when they affirm, that each ball contains filk enough to reach the length of fix Englifh miles.

In ten days time the ball is in its perfection, and is now to be taken down from the branches of the mulberry tree, where the worms have hung it. But this point requires a deal of attention: for there are fome worms more lazy than others; and it is very dangerous waiting till they make themfelves a paffage, which ufually happens about the fifteenth day of the month.

The firft, fineft, and ftrongeft balls are kept for the grain, the reft are carefully wound; or if it is defired to keep them all, or if there be more than can be well wound at once, they lay them for fome time in an oven moderately hot, or elfe expofe them for feveral days fucceffively to the greateft heats of the fun, in order to kill the infect, which, without this precaution, would not fail to open itfelf a way to go and ufe thofe new wings abroad it has acquired within.

Ordinarily, they only wind the more perfect balls; thofe that are double, or too weak, or too coarfe, are laid afide, not as altogether ufelefs, but that, being improper for winding, they are referved to be drawn out into fkains. The balls are of different colours; the moft common are yellow, orange-colour, ifabella, and flefh colour; there are fome alfo of a fea-green, others of a fulphur colour, and others white; but there is no neceffity for feparating the colours and fhades to wind them apart, as all the colours are to be loft in the future fcouring and preparing of the filk.

In the philofophical tranfactions, n° 252, we find the following obfervations concerning the goodnefs of filk, which is beft diftinguifhed by its lightnefs. The organcine filk is the beft made in the country of Piedmont of any; and two threads are equal in finenefs, that is, in fmoothnefs, thicknefs, and length, for the thread of the firft twift. For the fecond, it matters not whether the fingle thread be ftrong before the two are joined, unlefs to fee whether the firft twift prove well.

It is neceffary that the filk be clean; and it is to be obferved, that the ftraw-coloured is generally the lighteft, and the white the heavieft of all. The fkains fhould be even, and all of an equality, which fhews that they were wrought together: otherwife we may with juftice fufpect that it is refufe filk, and cannot be equally drawn out and fpun; for one thread will be fhorter than the other, which is labour and lofs.

It will alfo be requifite to fearch the bale more than once, and take from out of the parcels a fkain to make an effay; for unlefs it be known, by trial, what one buys, there is the greateft danger of being cheated in this commodity. To make an eftimate, and know the lightnefs, fix the effay upon one eighth of a portée or hand of filk of a hundred and ten aunes or ells of Lyons in length, and fee what it makes of aunes by the eighth part. The fkain, which is of eighty threads, muft be multiplied by a hundred and ten aunes of Lyon, and from this number muft be deducted one eighth: as for example, 110 by 80 makes 8800, the eighth part of which is 1100: and this is the eighth part of a portée, or hand of filk. Now, to calculate what thefe 1100 aunes weigh, which is the eighth part of a portée, or of 110 aunes of Lyons, it will be proper to take a fkain out of the parcels, which you take out from the bale which you judge may contain at leaft 1100 aunes, to make the one eighth part of a portée; which portée muft be divided on two bobbins, half on each; then fix the two bobbins on the centre, or beam, and from thence pafs it through the comb hurdiffoir, *viz.* 550 from the two bobbins, will make 1100, which will be one eighth part of what you defire to know. This done, you cut off your filk, and carry it to put on the hurdiffoir: then weigh it, and multiply the weight by eight, it will weigh juft as much as a portée of 110 aunes of Lyons, which is the general rule for calculating. When they draw the filk out by this means, one may learn to adjuft the weight.

There are filks of Piedmont, which are very light and clean, and are to be preferred before any on the fale: the portée of filk of the lighteft weighs near twenty-four penny-weights, and from this it arifes in gravity to twenty-five and twenty-fix penny-weights the portée, and fometimes to twenty-feven and twenty-eight: but even thefe weights may be difpenfed with, provided that the other qualities be good, that is, that it be well wrought, even and clean. When the filk is more than twenty-eight penny-weights the portée, it muft always be proportionably cheaper.

Methods of preparing SILKS. The feveral preparations which filks undergo to fit them to be ufed in the manufacture of filken ftuffs, are reeling, fpinning, milling, bleaching, and dying. To wind filks from off the balls, two machines are neceffary; the one a furnace, with its copper; the other a reel, or frame, to draw the filk. The winder, then, feated near the furnace, throws into the copper of water over the furnace (firft heated and boiled to a certain degree, which cuftom alone can teach) a handful or two of balls, which have been firft well purged of all their loofe furry fubftance. She then ftirs the whole very brifkly about with birchen rods, bound and cut like brufhes; and when the heat and agitation have detached the ends of the filks of the pods, which are apt to catch on the rods, fhe draws them forth; and joining ten or twelve, or even fourteen of them together, fhe forms them into threads, according to the bignefs required to the works they are deftined for: eight ends fufficing for ribbands; and velvets, *&c.* requiring no lefs than fourteen. The ends, thus joined into two or three threads, are firft paffed into the holes of three iron rods, in the fore-part of the reel, then upon the bobbins or pullies and at laft are drawn out to the reel itfelf, and there faftened each to an end of an arm or branch of the reel. Thus difpofed, the winder, giving motion to the

real,

reel, by turning the handle, guides the threads; ſubſtitutes new ones, when any of them break, or any of the balls are wound out; ſtrengthens them, where neceſſary, by adding others; and takes away the balls wound out, or that, having been pierced, are full of water.

In this manner, two perſons will ſpin and reel three pounds of ſilk in a day; which is done with greater diſpatch than is made by the ſpinning-wheel or diſtaff. Indeed, all ſilks cannot be ſpun and reeled after this manner; either by reaſon the balls have been perforated by the ſilk worms themſelves; or becauſe they are double, or too weak to bear the water; or becauſe they are coarſe, *&c.* Of all theſe together, they make a particular kind of ſilk, called floretta; which being carded, or even ſpun on the diſtaff, or the wheel, in the condition it comes from the ball, makes a tolerable ſilk.

As to the balls, after opening them with ſciſſars, and taking out the inſects (which are of ſome uſe for the feeding of poultry,) they are ſteeped three or four days in troughs, the water whereof is changed every day to prevent their ſtinking. When they are well ſoftened by this ſcouring, and cleared of that gummy matter the worm had lined the inſide withal, and which renders it impenetrable to the water, and even to air itſelf, they boil them half an hour in a lye of aſhes, very clear and well ſtrained; and after waſhing them out in the river, and drying them in the ſun, they card and ſpin them on the wheel, *&c.* and thus make another kind of floretta, ſomewhat inferior to the former.

As to the ſpinning and reeling of raw ſilks off the balls, ſuch as they are brought from Italy and the Levant, the firſt is chiefly performed on the ſpinning-wheel; and the latter, either on hand-reels, or on reels mounted on machines, which ſerve to reel ſeveral ſkains at the ſame time. See Reel.

As to the milling, they uſe a mill compoſed of ſeveral pieces, which may mill two or three hundred bobbins at once, and make them into as many ſkains.

For the dying of ſilk, ſee Dying.

SILPHIUM, in botany, a genus of the ſyngeneſia polygamia neceſſaria claſs. The receptacle is paleaceous; it has no pappus; the calix conſiſts of three valves; and the radius of the corolla is dimidiated. There are ſix ſpecies, none of them natives of Britain.

SILVER. See Chemistry, p. 79, 130.

SILVERING, the covering of any thing with ſilver. It is uſual to ſilver metals, wood, paper, *&c.* which is performed either with fire, oil, or ſize. Metal-gilders ſilver by the fire; painter-gilders all the other ways.

To ſilver copper or braſs: 1. Cleanſe the metal with aquafortis, by waſhing it lightly, and immediately throwing it into fair water; or by heating it red hot, and ſcouring it with ſalt and tartar, and fair water, with a ſmall wire-bruſh. 2. Diſſolve ſome ſilver in aquafortis, in a broad-bottomed glaſs veſſel, or of glazed earth, then evaporate away the aquafortis over a chaffing-diſh of coals. 3. Put five or ſix times its quantity of water, or as much as will be neceſſary to diſſolve it perfectly, on the remaining dry calx: evaporate this water with the like heat: then put more freſh water, and evaporate again, and, if need be, the third time, making the fire towards the latter end ſo ſtrong, as to leave the calx perfectly dry, which, if your ſilver is good, will be of a pure white. 4. Take of this calx, common-ſalt, cryſtal of tartar, of each a like quantity or bulk; and mixing well the whole compoſition, put the metal into fair water, and take of the ſaid powder with your wet fingers, and rub it well on, till you find every little cavity of the metal ſufficiently ſilvered over. 5. If you would have it richly done, you muſt rub on more of the powder; and in the laſt place waſh the ſilvered metal in fair water, and rub it hard with a dry cloth.

Silvering *of Glaſſes.* See Foliating *of Looking-glaſſes.*

SIMIA, the Monkey, in zoology, a genus of quadrupeds belonging to the order of primates. They have four foreteeth in each jaw, placed near each other; the dog-teeth are ſolitary, and remote; and the grinders are obtuſe. There are 33 ſpecies: Of theſe, three, *viz.* the ſatyrus, ſylvanus, and inuus, have no tail. Other three of them, *viz.* the nemeſtrina apedia, and ſphinx, have ſhort tails. The other 27 have long tails. The ſpecific diſtinctions are taken from the colour, and other circumſtances.—The monkey-kind are remarkable for activity, a low ſpecies of cunning, and a facility of imitating the actions of men and other animals. The ſagacity and docility of the ſimia are ſo well known, that it is needleſs to ſpend time in giving inſtances of either.

SIMILE, or Similitude, in rhetoric, a compariſon of two things, which though different in other reſpects, yet agree in ſome one. The difference between a ſimile and compariſon, is ſaid to conſiſt in this, that the ſimile properly belongs to whatever we call the quality of the thing, and the compariſon to the quantity.

SIMONICAL, is applied to any perſon guilty of ſimony. See Simony.

SIMONIANS, in church-hiſtory, a ſect of ancient heretics, ſo called from their founder Simon Magus or the magician. The hereſies of Simon Magus were principally his pretending to be the great power of God, and thinking that the gifts of the Holy Ghoſt were venal, and to be purchaſed with money. He is ſaid to have invented the Æons, which were ſo many perſons of whom the Godhead was compoſed. His concubine Helen, he called the firſt intelligence, and mother of all things; and ſometimes he called her Minerva, and himſelf Jupiter. Simon Magus gained a great many proſelytes, who paid himſelf and his concubine divine worſhip; theſe were the earlieſt heretics, and thoſe that St John, St Peter, and St Paul, in their epiſtles, ſo often warn the Chriſtians againſt.

SIMONY, in eccleſiaſtical law, the crime of buying or ſelling ſpiritual gifs or preferments. In the ancient Chriſtian church, this crime was always thought to be committed when men either offered or received money for ordinations. The apoſtolical canons lay a double puniſhment both of depoſition and excommunication on ſuch of the clergy as were found guilty of it. This was the firſt ſort of ſimony, and that which was moſt properly ſo called; and to this the ancients reduced the exacting of any reward for adminiſtering the euchariſt or baptiſm, or for any ſpiritual offices. A ſecond ſort of ſimony conſiſted in buying the ſpiritual preferments of the church: this was puniſhed with depoſition in any biſhop, who promoted any church-officer for the ſake of lucre; and the perſons ſo promoted were to be degraded from their office. By the laws of Juſtinian, every elector was to de-

poſe

pose upon oath, that he did not chuse the person elected for any gift or promise, or friendship, or any other cause, but only because he knew him to be a man of the true catholic faith, of unblameable life, and good learning. This last sort of simony was, when men, by ambitious arts and undue practices, got themselves invested in an office or preferment to which they had no regular call, or when they intruded themselves into other mens places which were legally filled before. The casuists for the church of Rome maintain, that all compacts or bargains in which benefices are concerned, are simonical, when it is done without the pope's concurrence; but that, once obtained, gives a sanction to the thing; which they found upon this universal proposition, that the pope cannot commit simony in beneficiary matters, since he hath a power so absolute over all the ecclesiastical goods and benefices, that he can unite, divide, and bestow them in whatever manner he pleases.

Against the corruption of simony, there have been many canons made in our own church, which punishes the offender with deprivation, disability, &c. and by a statute of the 31 Eliz. it is enacted, that if any person, for any sum of money, reward, gift, profit, or benefit, or by reason of any promise, agreement, grant, bond, covenant, or other assurance, shall present, or collate any person to any benefice with cure, dignity, or living ecclesiastical, every such presentation, or collation, and every admission or induction thereupon, shall be utterly void, and the crown shall present for that turn; and the person that shall give or take any sum of money, &c. shall forfeit double the value of one year's profit of any such benefice; and the person so corruptly taking any such benefice, shall from thenceforth be disabled to have and enjoy the same.

SIMPLE, something not mixed or compounded; in which sense, it stands opposed to compound.

SIMPLE, in pharmacy, a general name given to all herbs or plants, as having each its particular virtue, whereby it becomes a simple remedy.

SIN, a breach or transgression of some divine law, or command.

SINAI, a mountain of Arabia Petrea, situated east long. 35°, north lat. 29°, and memorable on account of the law's being given to the Jews on this mount.

SINAPI, in botany, a genus of the tetradynamia siliquosa class. The calix is open; the petals have straight ungues; and there is a nectarious gland between the short stamina and the pistillum, and between the long stamina and the calix. There are ten species, three of them natives of Britain, *viz.* the nigra, or common mustard; the alba, or white mustard; and the arvensis, or wild mustard.

Mustard-seed is an attenuant and resolvent in a very high degree; it warms the stomach, and excites an appetite; but its principal medicinal use is external in sinapisms, applications made to certain parts when irritation is intended, but not blistering. It is usually mixed with horse-radish root, and other ingredients of the same kind, for this purpose.

SINAPISM, in pharmacy, an external medicine, in form of a cataplasm, composed chiefly of mustard-seed pulverized, and mixed with the pulp of figs, or with briony, garlic, onion, or the like.

SINCIPUT, in anatomy. See ANATOMY, p. 156.

SINCOPORA, a promontory of Malacca in the East Indies, situated in 2° N. lat. opposite to the island of Sumatra, with which this cape forms the straits called the Straits of Sincopora.

SINDON, in surgery, a little round piece of linen, silk, or lint, used in dressing a wound after trepanning.

SINE, or *right* SINE *of an arch*, is a right line drawn from one end of that arch, perpendicular to the radius drawn to the other end of the arch; being always equal to half the chord of twice the arch. See TRIGONOMETRY, and GEOMETRY.

SINE-CURES, ecclesiastical benefices without cure of souls.

SINEW, denotes what we properly call a nerve; though, in common speech, it is rather used for a tendon.

SINGING, the action of making divers inflections of the voice, agreeable to the ear, and correspondent to the notes of a song, or piece of melody.

SINGULAR NUMBER, in grammar. See GRAMMAR.

SINISTER, something on, or towards the left-hand; sinister is also used among us for unlucky, though in the sacred rites of divination the Romans frequently used it in an opposite sense.

SINISTER, in heraldry. The sinister side of an escutcheon is the left-hand side; the sinister chief, the left angle of the chief; the sinister base, the left-hand part of the base.

SINISTRI, a sect of ancient heretics, thus called, because they held the left hand in abhorrence, and made it a point of religion not to receive any thing therewith.

SINKING FUND, a provision made by parliament, consisting of the surplusage of other funds, intended to be appropriated to the payment of the national debts; on the credit of which very large sums have been borrowed for public uses.

SINOPICA TERRA, in natural history, the name of a red earth of the ochre-kind, called also rubrica sinopica, and by some authors sinopis. It is a very close, compact, and weighty earth, of a fine glowing purple colour. It is of a pure texture, but not very hard, and of an even, but dusty surface. It adheres firmly to the tongue, is perfectly fine and smooth to the touch, does not crumble easily between the fingers, and stains the hands. It melts very slowly in the mouth, and is perfectly pure and fine, and of a very austere astringent taste, and ferments very violently with aqua-fortis. It was dug in Cappadocia, and carried for sale to the city Sinope, whence it had its name. It is now found in plenty in the New-Jerseys in America, and is called by the people there blood-stone. Its fine texture and body, with its high florid colour, must make it very valuable to painters, and its powerful astringency equally so in medicine.

SINOPLE, in heraldry, denotes vert, or the green colour in armories.

Sinople is used to signify love, youth, beauty, rejoicing, and liberty; whence it is, that letters of grace, abolition, legitimation, &c. are always used to be sealed with green wax.

SINUATED LEAF, in botany. See BOTANY, p. 640.

SINUOSITY, a series of bends and turns in arches, or other irregular figures, sometimes jutting out, and sometimes falling in.

SINUS, in anatomy, denotes a cavity of certain bones, and other parts, the entrance whereof is narrow, and the bottom wider and more spacious.

SINUS, in ſurgery, a little cavity, or ſacculus, frequently formed by a wound or ulcer, wherein pus is collected.

SION, a town of Switzerland, in the county of Valais, ſituated on the river Rhone, twenty-three miles ſouth-eaſt of the lake of Geneva, being a ſovereign ſtate.

SIPHON, a bended pipe, one end of which being put into a veſſel of liquor, and the other hanging out of the ſaid veſſel over another, the liquor will run out from the firſt into the laſt, after the air has been ſucked out of the external or lower end of the ſiphon, and that as long as the liquor in the upper veſſel is above the upper orifice of the ſiphon.

SIPHONANTHUS, a genus of the tetrandria monogynia claſs. The corolla conſiſts of one funnel-ſhaped petal, with eight ſegments; and there are two berries containing many ſeeds. There is but one ſpecies, a native of India.

SIRANAGER, a city of hither India, capital of the province of Siba, ſituated on the river Ganges: E. long. 80°, N. lat. 31° 30′.

SIRE, a title of honour in France, now given to the king only, as a mark of ſovereignty.

SIREN, in antiquity, a kind of fabulous animal, otherwiſe called a mermaid.

The ſirens are repreſented by Ovid, *&c.* as ſea-monſters, with womens faces and fiſhes tail; and by others decked with plumage of various colours. The three ſirens are ſuppoſed to be the three daughters of the river Achelous; and are called Parthenope, Ligea, and Leucoſia. Homer makes mention of only two ſirens, and ſome others reckon five. Virgil places them on rocks where veſſels are in danger of ſplitting. Some repreſent them as ſuch charming monſters, who ſung ſo harmoniouſly, that ſailors were wrecked on their rocks without regret, and even expired in raptures.

SIREN, in zoology, a genus belonging to the order of amphibia meantes. The body is naked, and furniſhed with two unguiculated feet, and a tail. It has a great reſemblance to a lizard, only it is larger. It is found in marſhy grounds in Carolina.

SIRIUS, in aſtronomy, a bright ſtar in the conſtellation canis. See ASTRONOMY, p. 487.

SISON, in botany, a genus of the pentandria digynia claſs. The fruit is oval and ſtriated; and the involucrum conſiſts of four leaves. There are ſix ſpecies, three of them natives of Britain, *viz.* the amomum, or baſtard ſtone-parſley; the ſegetum, or corn-parſley; and the inundatum, or leaſt water-parſnep. The ſeed of the amomum is one of the four leſſer hot ſeeds of the ſhops; and is an attenuant, aperient, and carminative.

SISYMBRIUM, in botany, a genus of the tetradynamia ſiliquoſa claſs. The pod opens with ſtraight valves; and the calix and corolla are open. The ſpecies are 25, ſeven of them natives of Britain. The young leaves of the cordamine, or ladies-ſmoke, and of the noſturtium, or water-creſſes, are recommended in the ſcurvy, and eaten in large quantities for that intention with great ſucceſs.

SISYRINCHIUM, in botany, a genus of the gynandria triandria claſs. The ſpatha conſiſts of two leaves, and the corolla of ſix petals; and the capſule has three cells. There is but one ſpecies, a native of Virginia.

SITE, denotes the ſituation of an houſe, *&c.* and ſometimes the ground-plot, or ſpot of earth it ſtands on.

SITOPHYLAX, in Grecian antiquity, an Athenian magiſtrate, who had the ſuperintendance of the corn, and was to take care that nobody bought more than was neceſſary for the proviſion of his family.

SITTA, in ornithology, a genus belonging to the order of picæ. The bill is ſubulated, cylindrical, ſtrait, and entire; the ſuperior mandible being longer than the inferior, and compreſſed at the point; the tongue is lacerated; and the noſtrils are covered with hairs. There are three ſpecies, diſtinguiſhed by their colour.

SIUM, in botany, a genus of the pentandria digynia claſs. The fruit is ſomewhat oval, and ſtriated; the involucrum conſiſts of many leaves; and the petals are heart-ſhaped. There are 8 ſpecies, three of them natives of Britain, *viz.* the latifolium, or great water-parſnep; the nodiflorum, or creeping water-parſnep; and the erectum, or upright water-parſnep.

SIXTH, in muſick, one of the ſimple original concords, or harmonical intervals. See MUSICK.

SIZE, the name of an inſtrument uſed for finding the bigneſs of fine round pearls. It conſiſts of thin pieces or leaves, about two inches long and half an inch broad, faſtened together at one end by a rivet. In each of theſe are round holes drilled of different diameters. Thoſe in the firſt leaf ſerve for meaſuring pearls from half a grain to ſeven grains; thoſe of the ſecond, for pearls from eight grains, or two carats, to five carats, *&c.* and thoſe of the third, for pearls from ſix carats and a half to eight carats and a half.

SIZE is alſo a ſort of paint, varniſh, or glue, uſed by painters, *&c.*

The ſhreds and parings of leather, parchment, or vellum, being boiled in water and ſtrained, make ſize. This ſubſtance is uſed in many trades.

The manner of uſing ſize is to melt ſome of it over a gentle fire; and ſcraping as much whiting into it as may only colour it, let them be well incorporated together; after which you may whiten frames, *&c.* with it. After it dries, melt the ſize again, and put more whiting, and whiten the frames, *&c.* ſeven or eight times, letting it dry between each time: but before it is quite dry, between each waſhing, you muſt ſmooth and wet it over with a clean bruſh-pencil in fair water.

To make gold-ſize, take gum animi and aſphaltum, of each one ounce; minium, litharge of gold, and umber, of each half an ounce; reduce all into a very fine powder, and add to them four ounces of linſeed-oil, and eight ounces of drying-oil; digeſt them over a gentle fire that does not flame, ſo that the mixture may only ſimmer, but not boil; for fear it ſhould run over and ſet the houſe a-fire, keep it conſtantly ſtirring with a ſtick till all the ingredients are diſſolved and incorporated, and do not leave off ſtirring it till it becomes thick and ropy; and being boiled enough, let it ſtand till it is almoſt cold, and then ſtrain it through a coarſe linen-cloth and keep it for uſe.

To prepare it for working, put what quantity you may have occaſion to uſe in a horſe-muſcle ſhell, adding ſo much oil of turpentine as will diſſolve it; and making it as thin as the bottom of your ſeed-lac varniſh, hold it over a candle, and then ſtrain it through a linen rag into another ſhell; add to theſe ſo much vermilion as will

make it of a darkiſh-red : if it is too thick for drawing, you may thin it with ſome oil of turpentine. The chief uſe of this ſize is for laying on metals.

The beſt gold-ſize for burniſhing is made as follows : take fine bole, what quantity you pleaſe ; grind it finely on a marble; then ſcrape into it a little beef-ſuet ; grind all well together ; after which mix a ſmall proportion of parchment ſize with a double proportion of water, and it is done.

To make ſilver-ſize : take tobacco-pipe clay, in fine powder ; into which ſcrape ſome black-lead and a little Genoa-ſoap ; and grind them all together with parchment-ſize, as already directed.

SKAITE, in ichthyology. See RAIA.

SKELETON, in anatomy. See ANATOMY, p. 151.

SKIE one of the greateſt weſtern iſlands of Scotland, divided from the counties of Roſs and Inverneſs by a narrow channel ; being upwards of ſixty miles in length and twenty in breadth.

SKIFF, the leaſt of two ſhip-boats, ſerving chiefly to go aſhore in, when the ſhip is in harbour.

SKIN, in anatomy. See ANATOMY, p. 254.

SKIN, in commerce, is particularly uſed for the membrane ſtripped off the animal to be prepared by the tanner, ſkinner, currier, parchment-maker, *&c.* and converted into leather, *&c.* See TANNING, *&c.*

Skins and the hair of beaſts manufactured become parchment and vellum ; leather, of which are made ſhoes and boots, ſaddles, harneſſes, and furniture for horſes, gloves and garments, coaches and chairs, houſehold ſtuff, covers of books, drinking veſſels, *&c.* and furrs for cloathing, hats, caps, *&c.*

SKINNER, one who works in ſkins. See SKIN.

SKIPTON, a town in the weſt riding of Yorkſhire, ſituated thirty five miles weſt of York.

SKIRMISH, in war, a diſorderly kind of combat, or encounter, in preſence of two armies, between ſmall parties, or perſons, who advance from the body for that purpoſe, and introduce to a general and regular fight.

SKULL, in anatomy. See ANATOMY, p. 151.

SKY, the blue expanſe of air and atmoſphere.

The azure colour of the ſky Sir Iſaac Newton attributes to vapours beginning to condenſe there, and which have got conſiſtence enough to reflect the moſt reflexible rays.

SLAB, an outſide ſappy plank or board ſawed off from the ſides of a timber-tree : the word is alſo uſed for a flat piece of marble.

SLATE, a ſtone of a compact texture and laminated ſtructure, ſplitting into fine plates

Dr Hill diſtinguiſhes four ſpecies of ſlate ſtegania : 1. The whitiſh ſteganium, being a ſoft, friable, ſlaty ſtone, of a tolerably fine and cloſe texture, conſiderably heavy, perfectly dull and deſtitute of brightneſs, variegated with a pale brown, or browniſh yellow : this ſpecies is very common in many counties in England, lying near the ſurface of the ground ; it is generally very full of perpendicular as well as horizontal cavities, many of which are filled up with a ſpar a little purer and more cryſtalline than the reſt, and is commonly uſed for covering houſes. 2. The red ſteganium is a very fine and elegant ſlate, of a ſmooth ſurface, firm and compact texture, conſiderably heavy, and of a very beautiful pale purple, glittering all over with ſmall gloſſy ſpangles : it is compoſed of a multitude of very thin plates or flakes, laid cloſely and evenly over one another, and cohering pretty firmly : this is very common in the northern parts of England, and is much valued as a ſtrong and beautiful covering for houſes. 3. The common blue ſteganium is very well known, as an uſeful and valuable ſtone, of a fine ſmooth texture and gloſſy ſurface, moderately heavy, and of a pale greyiſh blue ; compoſed of a multitude of even plates, laid cloſe upon one another, and eaſily ſplitting at the commiſſures of them : this is alſo very common in the north parts of England, and is uſed in moſt places for the covering of houſes. There are other ſpecies of this ſlate, *viz.* The browniſh blue friable ſteganium, uſually called coal ſlate ; the greyiſh black friable ſteganium, commonly called ſhiver ; and the greyiſh blue ſparkling ſteganium. 4. The friable, aluminous, black ſteganium, being the Iriſh ſlate of the ſhops : this is compoſed of a multitude of thin flakes, laid very evenly and regularly over one another, and ſplits very readily at the commiſſures of them. It is common in many parts of Ireland, and is found in ſome places in England, always lying near the ſurface in very thick ſtrata. In medicine, it is uſed in hæmorrhages of all kinds with ſucceſs, and is taken often as a good medicine in fevers.

There is a ſort of ſlate-ſtones called, by Dr Hill, ammoſchiſta. Of this kind there are only two ſpecies : 1. That compoſed only of ſparry and cryſtalline particles; or the grey, friable, dull ammoſchiſtum ; being a coarſe, harſh, and rough ſtone, of a very looſe texture, conſiderably heavy ; and compoſed of a large, coarſe, obtuſely angular gritt, ſurrounded, and in part held together, by a looſe earthy ſpar. This ſtone is very common in moſt countries, and is frequently uſed to cover houſes, inſtead of tiles : it bears the weather but badly, and is apt to crumble after froſts. 2. That compoſed of talcy, ſparry, and cryſtalline particles. This comprehends five ſpecies, *viz.* the browniſh white glittering ammoſchiſtum; the greeniſh grey ſhining ammoſchiſtum ; the yellowiſh grey glittering ammoſchiſtum ; the hard purple and white laminated ammoſchiſtum; and the bluiſh glittering ſlate ſtone. Theſe ſorts of ſlate-ſtone are very common in the northern countries, and are uſed in covering houſes, paving, building, *&c.*

SLAVE, a perſon in the abſolute power of a maſter, either by war or conqueſt. We find no mention of ſlaves before the deluge ; but immediately after, *viz.* in the curſe of Canaan : whence it is eaſily inferred, that ſervitude increaſed ſoon after that time ; for in Abraham's time we find it generally eſtabliſhed.

Among the Romans, when a ſlave was ſet at liberty, he changed his name into a ſurname, and took the nomen or prenomen of his maſter ; to which he added the cognomen he had been called by when a ſlave. Great part of the Roman wealth conſiſted in ſlaves : they had the power of life and death over them, which no other nation had ; but this ſeverity was afterwards moderated by the laws of the emperors. The ſlaves were eſteemed the proper goods of their maſters, and all they got belonged to them ; but if the maſter was too cruel in his correction, he was obliged to ſell his ſlave at a moderate price.

Slavery is abſolutely aboliſhed in Britain and France, as to perſonal ſervitude. Slaves make a conſiderable article

ticle of the traffick in America. The Britiſh ſouth-ſea company have, by treaty, the ſole privilege of furniſhing the Spaniſh Weſt Indies with ſlaves.

SLAUGHTER. See MANSLAUGHTER, HOMICIDE, MURDER, *&c.*

SLEDGE, a kind of carriage without wheels, for the conveyance of very weighty things, as huge ſtones, *&c.*

SLEEP, is defined to be that ſtate wherein the body appearing perfectly at reſt, external objects move the organs of ſenſe as uſual, without exciting the uſual ſenſations.

Sleep is broken off unnaturally, when any of the organs of ſenſation is ſo briſkly acted on, that the action is propagated to the brain.

Sleep being one of the non-naturals, it is not poſſible for thoſe to preſerve their health, who do not go to ſleep in a regular manner: for ſleep repairs the ſpirits, which are diſſipated by watching; and conſequently it reſtores the ſtrength of thoſe who are weak, indiſpoſed, or labour much. It likewiſe promotes perſpiration, contributes greatly to digeſtion, and more to nutrition. The night is the moſt proper for ſleep; for the vigour of the mind and body are better reſtored in the night than in the day; thus nocturnal labour and lucubrations impair the health.

SLEEPER, or the GREAT SLEEPER, in zoology. See MUS.

SLEEPERS, in natural hiſtory, a name given to ſome animals which are ſaid to ſleep all the winter; ſuch as bears, marmotes, dormice, bats, hedge hogs, ſwallows, *&c.* Theſe do not feed in winter, have no ſenſible evacuations, breathe little or not at all, and moſt of the viſcera ceaſe from their functions. Some of theſe creatures ſeem to be dead, and others to return to a ſtate like that of the fætus before the birth: in this condition they continue, till by length of time maturating the proceſs, or by new heat, the fluids are attenuated, the ſolids ſtimulated, and the functions begin where they left off.

SLEEPERS, in the glaſs-trade, are the large iron-bars croſſing the ſmaller ones, and hindering the paſſage of the coals, but leaving room for the aſhes.

SLEEPERS, in a ſhip, timbers lying before and aft, in the bottom of the ſhip, as the rung-heads do: the lowermoſt of them is bolted to the rung-heads, and the uppermoſt to the futtocks and rungs.

SLESWICK, the capital of the duchy of Sleſwick, otherwiſe called South Jutland, ſituated on the river Sley: E. long 9° 45′, and N. lat. 54° 45′. See JUTLAND.

SLIDING, in mechanics, is when the ſame point of a body, moving along a ſurface, deſcribes a line on that ſurface.

SLIGO, a county of Ireland, in the province of Connaught, bounded by the ocean on the north, by Letrim on the eaſt, by Roſcommon on the ſouth, and by Mayo on the weſt.

SLING, an inſtrument ſerving for caſting ſtones with great violence. The inhabitants of the Balearic iſlands were famous in antiquity for the dexterous management of the ſling: it is ſaid they bore three kinds of ſlings, ſome longer, others ſhorter, which they uſed according as their enemies were either nearer or more remote. It is added, that the firſt ſerved them for a head-band, the ſecond for a girdle, and that a third they conſtantly carried with them in the hand.

SLIPPING, among gardeners, the tearing off a ſprig from a branch, or a branch from an arm of the tree. Theſe ſort of ſlips take root more readily than cuttings.

SLOANEA, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of five petals, and the calix of five deciduous leaves; the ſtigma is perforated; and the berry contains many ſeeds.

SLOATH, in zoology. See BRADYPUS.

SLOE. See PRUNUS.

SLOOP, a ſort of floating veſſel, otherwiſe called ſhallop. In our navy, ſloops are tenders on the men of war, and are uſually of about ſixty tons, and carry about thirty men.

SLOUGH a deep muddy place. The caſt ſkin of a ſnake, the damp of a coal-pit, and the ſcar of a wound, are alſo called by the ſame appellation. The ſlough of a wild boar, is the bed, ſoil, or mire, wherein he wallows, or in which he lies in the day time.

SLUCZK, the capital of the palatinate of the ſame name, in the duchy of Lithuania and kingdom of Poland: ſituated in E. long. 27°, and N. lat. 53°.

SLUICE, in hydraulics, a frame of timber, ſtone, earth, *&c.* ſerving to retain and raiſe the water of the ſea, a river, *&c.* and on occaſion to let it paſs: ſuch is the ſluice of a mill, which ſtops and collects the water of a rivulet, *&c.* in order to diſcharge it at length in greater plenty upon the mill-wheel; ſuch alſo are thoſe uſed in drains, to diſcharge water off lands; and ſuch are the ſluices of Flanders, *&c.* which ſerve to prevent the waters of the ſea overflowing the lower lands, except when there is occaſion to drown them. See CANAL.

SLUTTELBURG, a town of Ruſſia, in the province of Ingria, ſituated on the ſouth-ſide of the lake Ladogo, in E. long. 31° 20′, N. lat. 60°.

SLUYS, a port-town of Dutch Flanders, ſituate oppoſite to the iſland of Cadſant: E. long 3° 15′, N. lat. 51° 18′.

SMACK, a ſmall veſſel with but one maſt.

SMALAND, a province in Sweden, in the territory of Gothland, bounded by Eaſt Gothland, on the north; by the Baltic ſea, on the eaſt; by Blecking, on the ſouth; and by Halland, on the weſt

SMALLAGE, in botany. See APIUM.

SMALT, a preparation of arſenic. See CHEMISTRY, p. 145.

SMARAGDUS, in natural hiſtory. See EMERALD.

SMARIS, in ichthyology. See SPARUS.

SMELL, with regard to the organ, is an impreſſion made on the noſe, by little particles continually exhaling from odorous bodies: with regard to the object, it is the figure and diſpoſition of odorous effluvia, which ſtriking on the organ, excite the ſenſe of ſmelling: and with regard to the ſoul, it is the perception of the impreſſion of the object on the organ, or the affection in the ſoul reſulting therefrom.

The principal organs of ſmelling are the noſtrils, and the olfactory nerves; the minute ramifications of which latter are deſcribed throughout the whole concave of the former. See ANATOMY, p. 293.

SMELT, in ichthyology, a ſpecies of ſalmo, See SALMO.

SMELTING, in metallurgy, the fuſion or melting of the ores of metals, in order to ſeparate the metalline part

from

from the earthy, ftony, and other parts. See CHEMISTRY, *paffim*.

SMILAX, in botany, a genus of the diœcia hexandria clafs. The calix both of male and female confifts of fix leaves; none of them have any corolla; the ftylus of the female is trifid; and the berry has three cells, containing two feeds. There are 13 fpecies, none of them natives of Britain.

SMITHERY, a manual art, by which an irregular lump of iron is wrought into any intended fhape, by means of fire, hammering, filing, *&c.*

SMOKE, a denfe elaftic vapour, arifing from burning bodies. As this vapour is extremely difagreeable to the fenfes, and often prejudicial to the health, mankind have fallen upon feveral contrivances to enjoy the benefit of fire, without being annoyed by fmoke. The moft univerfal of thefe contrivances is a tube leading from the chamber in which the fire is kindled, to the top of the building, through which the fmoke afcends, and is difperfed into the atmofphere. Thefe tubes are called chimneys; which, when conftructed in a proper manner, carry off the fmoke entirely; but, when improperly conftructed, they carry off the fmoke imperfectly, to the great annoyance of the inhabitants As our mafons at prefent feem to have a very imperfect knowledge of the manner in which chimneys ought to be built, we can hardly perform a more acceptable fervice to the public than to point out the manner in which they ought to be conftructed fo as to carry off the fmoke entirely; as well as to explain the caufes from which the defects fo often complained of generally proceed, and the method of removing them.

Although we would naturally imagine, that the caufes which occafion fmoke in rooms are exceedingly various; yet, upon examination, it will be found that they may all be reduced to one of thefe three general heads, each of which will admit of feveral varieties.

I. To a fault in the form of the tube, or chimney itfelf.

II. To fome fault in the other parts of the building, and a wrong pofition of the chimney with refpect to thefe. Or,

III. To an improper fituation of the houfe with refpect to external objects. And it is of the utmoft confequence, in attempting a cure, accurately to diftinguifh from which of thefe defects the fmoke proceeds, it will be neceffary to point out with care the feveral phenomena which are peculiar to each.

I. Of fmoke occafioned by a fault in the form of the chimney itfelf. But, before we proceed, it will be neceffary to premife fomething with regard to the general caufe of the afcent of fmoke in chimneys.

The earth is every where furrounded with a great body of air called the atmofphere. This air is an elaftic fluid fubjected to many particular laws, as hath been fully explained under the article PNEUMATICS; where it hath been fufficiently demonftrated, that, like other fluids, it hath a conftant tendency to preferve an equilibrium in all its parts; fo that, if at any time the weight of it at one place is diminifhed, the heavier air rufhes from all fides towards that point, till the equilibrium be again reftored. We there likewife faw, that heat was one of the moft powerful means of difturbing this general equilibrium of the air, by expanding it to a great degree, and making the fame quantity occupy a much greater fpace than before, and confequently become lighter. Hence it neceffarily follows, that where-ever a fire is kindled, the air immediately contiguous to it will be heated, and of confequence rarified and made light; which muft afcend into the higher regions of the atmofphere, till it becomes of the fame gravity with the air contiguous to it; while the denfer cold air below rufhes toward the point from which it departed, is there heated and rarefied in its turn, and afcends in the fame manner, carrying the fmoke or vapour arifing from the burning body along with it. In this manner that conftant fuction of air towards every fire is produced, and from this caufe proceeds the conftant tendency of fmoke to afcend upwards from the furface of the earth. But as the body of our atmofphere is often agitated with wind, *&c.* and as it is an elaftic fluid, it endeavours to fpread itfelf every way; from which caufes the warm air would quickly be diffufed among the cold air before it could arife to any confiderable height; fo that the fmoke would always remain low, and be toffed about near the furface of the earth: all of which inconveniencies are avoided by confining this heated air in a tube, which prevents it from mixing with the external air, till it arrive at the height to which we defire it fhould afcend.

To render this ftill more clear, fee Plate CLVI. where AB (fig. 1.) reprefents the tube of a chimney, having a fire at the bottom at A. It is obvious, that, in this fituation, the air which was heated by the fire at A, will afcend directly upwards, without mixing with the external air, till it arrives at B, beyond which it will be at liberty to difperfe in the atmofphere; and the more weighty air which preffes in to fupply its place can have no accefs to it but at the opening between A and E, where it alfo is heated by the fire, and in its turn afcends to the top of the chimney, thereby occafioning a conftant ftream of air to afcend up the chimney, which carries the fmoke along with it. This is the manner in which fuliginous vapours are made to afcend in chimneys; and by attending to it, we may draw the following corollaries with regard to the conftruction of this ufeful part of our habitations.

1ft, The higher the chimney, that is, the greater the diftance between the fire-place and the top of the chimney, the greater will be the difference between the weight of the column of heated air in the tube, and another column of the atmofphere of the fame diameter without the chimney, and confequently the air will enter with the greater force at the opening AE, and carry up the fmoke more readily along with it: for as the warm air within the tube continues rarefied to a high degree till it iffues from the top of the chimney, and is, in every part of its length, lighter than the fame bulk of external air marked by the dotted line CD, it follows, that the longer thefe two columns of unequal gravity are, the greater muft be the difference of their weight. Hence it is, that high chimneys (*cæteris paribus*) have a greater fuction of air, and are lefs liable to vent ill, than low ones. A fmoky chimney may therefore fometimes be cured by raifing it higher. It is likewife obvious, that if any opening is made into the chimney, as at F, the air will enter with lefs force at E, and carry up the fmoke with lefs velocity, and by that means be in danger of producing fmoke in the room; for this opening, as it admits the frefh air into the tube, has nearly the fame effect as fhortening the tube fo much would have.

2d, As the fmoke is forced up the chimney merely by the rarefaction

rarefaction of the air in consequence of heat, it is evident, that the more the air is heated, with the greater force (*ceteris paribus*) will it ascend, because the difference between the weight of the external and internal air will be greater; and as the air will be the more heated the nearer it is made to pass by the fire in its entry into the chimney, it is evident, that the smaller the opening at AE is, or, in other words, the lower the mantle of the chimney is, the air will be forced to pass the nearer the fire, and therefore be more rarefied, and ascend with the greater velocity; so that lowering the mantle of the chimney will often cure smoke.

But it is frequently inconvenient to have the mantle of the chimney too low. However, the same effect may often be produced by another contrivance. For as the fire-place is usually made wider than the length of the grate, a great deal of cool air passes at the two sides of the grate without being much heated. This greatly diminishes the suction of the chimney: but it may easily be prevented by building up the vacancies at each side of the grate, so as to allow no air to enter from below, except what comes immediately through, or before the fire. For this purpose, grates consisting of a neat hewed stone at each end, with a breast and bottom of iron fitted to them, as represented at fig 2. are extremely convenient. But the aperture of the chimney is often not suddenly contracted above the mantle, but goes up tapering slowly, as in the same fig. 2. This structure allows a quantity of cool air to enter at the two corners of the mantle, and steal up the tube without coming near the fire. The most easy and effectual method of remedying this defect, is to place a sheet of milled iron within the mantle on each side, as low down as possible, making them slant a little upwards towards the middle of the chimney; as at A, fig. 2. the mantle being represented by the dotted line. By this contrivance, the air, which enters at the side of the mantle, before it can ascend into the chimney, is forced to pass very near the fire, and of course is much rarified. The good effects of this would be still more strongly felt, if one of these plates were placed a little lower than the other, and made so long, that the ends should cross each other, as at AB, fig. 2. by which means every particle of air that went up the chimney behoved to pass immediately above the fire. It is almost unnecessary to observe, that these plates ought to be so contrived as to be taken out at pleasure to allow the chimney to be cleaned.

A chimney may not only be defective by having the mantle too high, or by being too wide from side to side, but also by being too deep between the fore side and the back, as is often the case in very old houses. In this case, the distance between the fire and the mantle is so great, that much air passes up without being sufficiently rarified, as is represented at fig. 3. This may be sometimes cured by bringing the grate a little forward, which, by making the fire act more powerfully upon the mantle, rarefies the air more in its passage. But this can seldom produce the desired effect, and it often does harm: for when the grate is brought forward, there is a great vacancy left between it and the back of the chimney, so that the air passes under the grate, and ascends behind it very little rarified; so that, if the feet of grate are not very low, there will be as much lost in this way as will be gained in the other; and as there is not enough of heated air in the chimneys of this kind to make the vapour ascend with rapidity, they are often choaked with thick fuliginous vapours hanging in them, almost in equilibrio with the rest of the atmosphere, so that the least puff of wind beats them down the chimney, and pushes the smoke into the room; whereas, when it is far back, it is driven down upon the hearth, and rises upwards again when the gust is over, and a great deal of it is catched within the mantle as it rises, which in the other case would have been dispersed through the room. When this is the case, the most effectual method of cure is, to bring the grate forward till the forepart of it is immediately under the inner edge of the mantle; then build up the vacancy at the back of it, the whole width of the fire-place from side to side, raising it perpendicularly till it is as high as the back of the grate, and then bending it foreward towards the mantle, as is represented at fig. 4. When it is as high as the workman can reach, let it be suddenly turned backward again, sloping a little upward, as in the figure; then fit a sheet of milled iron to the inside of the mantle, making it slant a little upward toward the back part, at a small distance above the new-erected masonry, and extending within a few inches of the back wall, as at A, fig. 4. By this construction all the air that enters into the chimney is made to pass immediately above the fire, between it and the heated iron, upon which the flame acts with the greater force, as the back of the fire-place is bent a little forward above the grate, and the heat is likewise reflected into the room with the greater force: at the same time, if the smoke is at any time beat down the chimney by a sudden gust of wind, it will be catched by the sheet of iron, and prevented from coming into the room. If the fire-place be very wide between the the one side and the other, the new masonry may be carried quite up to the sheet of iron on each of the sides.

3d, As every fire requires a constant succession of fresh air, the tube for conveying this rarefied air to the higher regions of the atmosphere must be of a sufficient size to contain the whole of it, and allow it a ready passage; otherwise a part of it will be forced to seek some other passage; by which means, the apartment in which the fire is placed will be constantly filled with smoke. Every chimney therefore ought to have a degree of wideness sufficient to carry off the whole of the smoke arising from the fire usually burnt in it, otherwise the apartment will be almost continually filled with smoke.—This is a fault more common at present than any of those already mentioned, especially in large towns, where the number of chimneys in one wall is often so great that it is difficult to get a sufficient space for each. The most obvious cure, where the situation admits of it, is to widen the chimney, by opening a hole a little above the grate thro' the back-wall of the chimney, slanting a little upward, and building on the outside of the wall a small chimney open from that hole to the top of the building, as in fig. 5. where AB represents the new tube going through the wall at the opening at A, which will receive the superfluous smoke, and carry it off. This additional chimney must always be carried as high as the other. But as there are many situations in which this method of cure would be impracticable, we must try every method for accelerating the ascent of the smoke; (for the more quickly it ascends, the more narrow may the tube be;) and with that view, the chimney may be heightened at top, and contracted at bottom, in any or all the various ways we have mentioned. But if none of these methods prove effectual, let the chimney be built quite close at the under part, leaving only as much room as is sufficient to contain the grate, having a cover of metal fitted to that opening

pening, which can be taken off or put on at pleafure; by which the whole air that enters into the chimney is made to pafs through the fire like a furnace, and carries the fmoke up it with great velocity. Thefe are well known in large towns by the name *fmoke-chimneys:* but as they occafion a a prodigious wafte of fewel without warming the room, and, unlefs attended with very great care, are in danger of fetting the building on fire, they ought to be as much avoided as poffible. But if neither this, nor any of the other methods prove effectual, the wall muft either be taken down and rebuilt in a proper manner, or the chimney abandoned as incurable. As this is a defect more difficult to be remedied than any other, we would ftrongly recommend it to every builder to build his chimneys of a fufficient width throughout; there is no danger of erring on this extreme, as it is eafy to remedy any defect that might arife from it.

4th, As the air which afcends through the chimney continues nearly of an equal degree of heat to the top, the tube fhould be of an equal degree of width at the top as at the bottom, as well as through the whole of its length. It ought not therefore to be made tapering gradually from the fire-place to the top, but to be fuddenly contracted above the grate, as in fig 6. from which it ought to be continued of an equal widenefs throughout its whole length; but if it is narrower at any one place than another, it ought to be at the under part, immediately above the fire, for a very fhort fpace; becaufe, as this is within reach of the hand, the foot can be cleaned from it as often as is neceffary, fo that when the other parts of the chimney are full and clogged with foot, they will not be narrower than this place is at that time.

5th, It feldom happens that a chimney can be carried quite ftraight upwards: and it is an advantage that it is fo, as they ought always to be bent a little. For if a chimney be ftraight, and of a proper width to tranfmit the whole of the fmoke and no more, it will not be fufficient for that purpofe, when there is a heavy fall of rain, or fnow, or hail, with little wind; for the great drops will fall perpendicularly from the top to the bottom of the chimney; and as they occupy a confiderable fpace, the fmoke will not have room to afcend, but muft be forced down with the fhower, and difperfed in the apartment: whereas, if the chimney is bent, the rain falls upon fome of the fides, and glides gently down without difturbing the afcent of the fmoke. The fame inconvenience will be felt in a ftraight chimney, where it is fo placed as to be expofed to winds which fometimes enter the top and blow down with a fudden puff: for, if it be ftraight, the air meets with no interruption till it defcends into the chamber, and there difperfes the fmoke; but if it be crooked, the defcent of the wind will be obftructed its force broken, and the bad effects of it in a great meafure prevented. Upon the whole, bent chimneys are always preferable to ftraight ones. However, a perpendicular chimney may be eafily cured, by fome of the contrivances after mentioned.

Thefe are the moft general defects arifing from the ftructure of the chimney itfelf, which are all reducible to the following caufes: 1. Too little height; 2. Too great widenefs of the bottom of the chimney; 3. Too little width; 4. Unequal widenefs between the top and bottom; and, 5. Straightnefs of the tube. We have pointed out the beft methods of curing each of thefe defects; and to finifh our remarks on this general head, and give the reader a more perfect idea of the beft form of conftruction for a chimney, we have drawn two different fections of one conftructed on the jufteft principles, in figures 6. and 7. the feveral parts of which appear fo plain from the figures, and the reafons for this conftruction have been already fo clearly affigned, that a very fhort explanation will be fufficient. Figure 6. reprefents a front-view of the fire-place; fuppofing the fore-part of the wall taken down, and the chimney laid bare from top to bottom; AB, and DC, reprefenting the two fides of the fire-place; and BC, the mantle, being cut through, to fhew the manner in which the aperture is fuddenly contracted, immediately above the fire within the mantle. The tube from the point E, to the top, ought to be of an equal widenefs, and bent in any direction that may be convenient. The two planes, F F, reprefent the two fides of the fire-place, which ought to be as much floped inward towards the back as the form of the grate will admit of; for the more they are inclined, the more powerfully will they reflect the heat into the apartment. Fig. 7. reprefents a perpendicular fection of the wall, through the middle of the chimney, to difcover its fhape, if viewed from a fide. And here it is to be obferved, that it ought ever to be a rule to bring the building at the under part of the chimney immediately behind the grate, as far forward as poffible, becaufe this throws more heat into the chamber than if it were placed farther back: but as the fore-part of the grate ought never to project beyond the inner edge of the mantle, care fhould be taken to have the under part of the mantle wrought as thin as the nature of the materials will admit of, making it thicker towards the upper part, fo as to flope inwards above the fire, as reprefented at B, fig. 7. To throw the heat outward, let the upper part of the back of the fire-place be a little inclined outward, as at C; but, after it is carried up in this manner a little higher than the mantle, let it be fuddenly turned back, as in the figure, the projection above the mantle inclining backward in the fame direction, being carried up to the top at an equal widenefs the whole way.

Although it is neceffary to have all chimneys pretty wide; yet this, on many occafions, is attended with inconveniences: for as they tranfmit a great quantity of heated air, too large a portion of that warm air which ought to heat the chamber is carried off; and as it is only when the fire is firft kindled that the great quantity of grofs vapour is exhaled which fills the chimney, and maketh a large tube neceffary, if it were fo contrived as to contract or dilate at pleafure, we might have our chimney of a fufficient width to convey away the greateft quantity of fmoke that could ever have occafion to pafs through it, at the fame time that we might never allow more air to pafs off at other times than was neceffarry to carry away the whole of the fmoke, by which means a much fmaller quantity of fewel would keep our apartment equally warm. This we apprehend might be accomplifhed by the following fimple apparatus. Let a fheet of milled iron be fixed at the upper part of the mantle, on the infide, at B, in fuch a manner, as that, by means of a fmall wire *de*, paffing through a fmall hole left for that purpofe in the fore-part of the chimney, it might be let down at pleafure towards C, or drawn up towards B, fo as to apply quite clofe to the upper edge of the chimney between B and C. This would leave the tube of its

its full widneſs when neceſſary, or cloſe it to any degree at pleaſure, with the greateſt eaſe *. It is unneceſſary to add, that the plate at A fig. 4. might be employed in the ſame manner, when it ſhould be found convenient. So much for what relates to the conſtruction of the chimney itſelf. We now proceed to conſider the ſecond general cauſe of ſmoke, *viz.*

II. Of ſmoky houſes proceeding from faults of other parts of the building, altogether independent of the ſtructure of the chimney itſelf.

1ſt, The firſt we ſhall mention is too great cloſeneſs of the room. Smoke, as ſhewn above, is impelled up the chimney by the preſſure of the air entering at the fire-place and aſcending upwards; but, if freſh air is not admitted into the apartment in ſufficient quantities to ſupply the conſumption by the fire, the room will be quickly exhauſted, and the air in it become as light as the external air at the top of the chimney, ſo that the ſmoke will as readily be diſperſed into the chamber as through the chimney. But if any door or window is opened ſo as to admit plenty of free air, the ſmoke will be quickly diſpelled, and the proper circulation eſtabliſhed: the ſame effect will be produced by making a ſmall hole in ſome of the ſides of the room; but unleſs this be done with ſome judgment, it may frequently add to the diſeaſe, as it may concur with ſome of the other cauſes of ſmoky houſes, to be afterwards mentioned. A better method of remedying this evil would be to have a ſmall hole made in the wall at the back of the chimney, and immediately underneath it: or a ſmall perforation, made in the wall in any other convenient manner; the one end of which ſhould communicate with the external air, and the other communicate with the chamber in any place near the grate, and as low down as poſſible, through which a conſtant ſupply of air would be adminiſtered to the fire without the ſmalleſt inconvenience or trouble. If this were practiſed, doors and windows might with ſafety be made much cloſer than at preſent, and our apartments rendered equally warm and comfortable with a much ſmaller quantity of fewel than we uſe at preſent. For as the fire, in the preſent mode of conſtructing chambers, is kept alive by a conſtant ſucceſſion of cold air from the doors, windows, and other crannies of the room ruſhing towards the chimney in all directions, the air of the room, which, if not cooled by this means, would be quickly heated to a great degree, is conſtantly kept cold in ſpite of the ſtrong heat of a blazing fire; which, at the ſame time that it ſcorches the parts of our body which are moſt expoſed to it, does not warm the parts which are turned from it; and we experience at the ſame time a burning heat and piercing cold, which is often productive of the moſt diſagreeable effects. But if the fire were ſupplied with air in the manner abovementioned, there would be leſs air drawn in through the crannies of the room, ſo that the air within would be ſoon warmed, and continue long ſo even with a ſmall degree of heat. However improper this might be for people in perfect health, it might ſurely be of great uſe for thoſe who are in a weakly habit of body; eſpecially if care were taken to carry off the foul air, by having a ſmall tube leading from the upper part of the room to the top of the houſe, through which the air which had been rendered noxious by the ſmoke of candles or perſpiration would be conveyed away, and a ſucceſſion of freſh air admitted from the tube near the fire-place to ſupply that want. That the reader may more readily comprehend what is here meant, we have repreſented in fig. 6. a view of two ſmall tubes for this purpoſe ſuppoſed to be laid open by taking away the boxing or inner-coating of the wall which ought to cover them. Theſe are of wood, and muſt not be above one inch in diameter. One end, *g g*, goes quite through the outer wall of the houſe, and communicates with the open air, having a ſmall grate upon it to prevent vermin from entering, The other end, *h h*, paſſes behind the two ſlabs at the ſide of the fire-place, and open in the inſide of the fire-place at *i i*, at which place they have each of them a ſmall bit of braſs fitted to them, being cloſed with two ſliding doors exactly like thoſe that are uſed to cover the end of teleſcopes, by means of which more or leſs air may be admitted at pleaſure.

2d, A ſecond cauſe of ſmoke, is the wrong poſition of doors and windows, with reſpect to the fire-places.

As the ſmoke is impelled up the chimney by the preſſure of the air, if that air is driven away from the fire-place by any cauſe more powerful than the ſuction occaſioned by the fire, the ſmoke muſt alſo be drawn away with it, and follow the ſame directions with that current of air; ſo that whatever tends to draw a current of air from the under part of the chimney, will alſo tend to produce ſmoke in the houſe; from whence it is eaſy to conceive how doors or windows may occaſion ſmoke when the wind is in certain directions. Thus, ſuppoſe a chamber, A, B, C, D, fig. 8. having a door or window at E, another at F, and a fire-place at G; when the wind is in the direction D A or C B, the general current of air will occaſion a ſort of ſuction at the opening E, ſo that the air will be drawn from the chimney G towards E: and if the current be ſtrong, and the opening at E large, it will become more powerful than the ſuction of the chimney, and produce ſmoke in the apartment. If the window at F ſhould be opened in this caſe, it would not mend the matter; for any wind which ſhould enter at F, would be carried ſtreight out at the opening E, and the current of air would be drawn from the chimney as ſtrong as ever. If the window at E were ſhut, and that at F left open, and the wind ſtill continued in the ſame direction as before, the current of air ruſhing paſt the window would have a tendency to draw the air of the room along with it, and

* If any one ſhoud think, that the wire *d* would be a diſagreeable object in the middle of a chimney-piece, it might eaſily be hid by a picture of any kind. The wire might be fixed to a ſmall braſs-handle moving freely upward and downward like that for a bell; only this ſhould have a long ſlit in the middle of it, with notches on each ſide, to receive a pin placed in the middle of the ſlit, by means of which the wire might be lengthened or ſhortened at pleaſure. The whole of this apparatus is repreſented at fig. 16. where (*a*) repreſents the wire faſtened to the braſs-plate; (*b*) a piece of braſs, raiſed a little, to ſerve as a handle. The ſlit in the middle is repreſented by the dark line, having notches *c c c* at convenient diſtances. The pin *d* is fixed into the wall, but left at liberty to turn about with eaſe; and its head ſtands up a little, ſo as to be eaſily turned with the finger and thumb. The body of this nail is made ſo thin in one direction, that when it is turned half round, it eaſily paſſes through the ſlit in the plate; but in the other direction its diameter is greater, ſo that when the plate is brought ſo as to have one of the notches oppoſite to the nail, and it is then turned half round, it catches the plate ſo that it cannot be moved till the nail is again turned about.

and occaſion ſmoke, but not ſo powerfully as if the window at E were open; but if the wind were in the direction D B, it would be very bad: but if it blew in the direction C A, the caſe would be very much altered; for then a quantity of air being forced in at the opening F, and finding no ready paſſage, it would be pent up in the chamber, and force itſelf up the chimney with violence. We omit mentioning what would be the effect if the wind were in other directions, as it is imagined theſe will be ſufficiently obvious to every attentive obſerver. It is only neceſſary here to obſerve, that as doors or windows are ſeldom ſo exactly made, but they produce ſome effect, as they always admit ſome air even when ſhut, and often occaſion ſmoke when the wind blows from a particular quarter; and as workmen and others generally apprehend, when houſes are troubled with ſmoke in this manner, that it is occaſioned by ſome external cauſe, and apply their attention to cure it by altering the top of the chimney, which never can produce the ſmalleſt ſervice in this caſe; we would recommend a more particular attention to be paid to the ſituation of doors and windows than is generally beſtowed; eſpecially in ſuch ſituations where they are expoſed to any violent current of air in a particular direction, as in narrow lanes or defiles of any ſort, where the wind, when in particular directions, is hurried along with a prodigious rapidity. And, that the effects of different poſitions may be ſtill more obvious, we ſhall produce ſeveral other examples.

Suppoſe a chamber, fig. 9. having a door at A, and two windows B C, with a fire place D. If the wind came in the direction DA, and if the door tranſmitted as much or more air than was admitted at both the windows, a current of air would run from all parts of the chamber towards A, and therefore would have a tendency to occaſion ſmoke: but if as much or more air came in at the windows than could get out at the door, there could be no ſuch current; but, on the contrary, it would be forced up the chimney, and carry the ſmoke along with it: wherefore in this ſituation, a room might ſometimes be cured of ſmoke, by making the door as cloſe as poſſible; nothing could be more hurtful in this caſe than boring a hole in the door. But if the houſe was in ſuch a ſituation as to be more frequently expoſed to a wind which came in the direction of AD, it would run little riſk of being troubled with ſmoke.

Suppoſe a room, fig. 10. having a door at A, and two windows B and C, with a fire-place D. If the wind came in the direction CB or BC, and both the windows were open, it is evident that the ſmoke would be drawn from the chimney by the ſtrong current of air paſſing through the room; or if the window upon which the wind came were cloſed, and the oppoſite one open, nearly the ſame effect would be produced: but if the window upon which the wind blew were open, and the oppoſite one and the door ſhut, the room would be immediately cleared of ſmoke entirely. In this ſituation, it is evident, that if the windows were badly made, ſo as to admit much air, it would tend to occaſion ſmoke, eſpecially if the door were in the ſame ſituation; it is therefore of conſequence to attend to this circumſtance in a ſituation ſimilar to this.

Having premiſed ſo much with regard to ſingle rooms, we ſhall now proceed to conſider a more compound ſtructure. Thus, let fig. 11. repreſent a building conſiſting of two chambers, K L, joined by a paſſage. The chamber K having a door B communicating with the paſſage, a window F, and fire-place G; and that at L having a door C, another door or window D, the window E, and fire-place H, the entry to the whole being by the door A. Let us now conſider what would be the effect of the wind coming from different directions upon this building. And firſt, ſuppoſe the wind blew in the direction AM: If all the doors and windows were cloſe ſhut, and very little air were admitted, there would be little riſk of ſmoke; but as there would ſurely be ſome admitted through theſe different openings, there would be ſome chance that the chamber L would be troubled with ſmoke, becauſe of ſome the air which forced its paſſage through the chinks of the door A would paſs through the doors C and D, which might produce ſmoke in a ſmall degree. There would be little chance that the chamber K would ſmoke in this caſe; becauſe although there is a general ſuction through the paſſage from B to D, yet as it is in ſome meaſure interrupted by the cloſe door at C, it will be but ſmall; and as the wind is interrupted in its courſe by the wall of the paſſage, ſome of it will be forced through the chinks of the window F, which would more than counterbalance the effects of the other ſuction. But if the door D were open, both the chimneys would ſmoke; eſpecially if the doors B and C were open alſo, as the current would be then very ſtrong towards that point. But in all caſes the ſmoke of this houſe would be prevented by keeping the door at D ſhut, and that at A open; but if the houſe was in ſuch a ſituation as to be more expoſed to that wind than any other, it would be better to cloſe up the door D altogether. If the wind more commonly came from M towards A, it is more than probable that a houſe ſituated like this would be quite free of ſmoke, as the general current of air would be towards the chimneys; but the chamber K would run greater riſk than L, as the ſuction might ſometimes be drawn towards the window F; but if the door A were in the oppoſite ſide of the paſſage, that inconvenience would be avoided alſo. If the more general current of air were from K towards L, this houſe behoved to be troubled with ſmoke unleſs the windows were very cloſe: but there would not be the ſmalleſt chance for that, when it came from L towards K.

We might now proceed to give more examples of this ſort: but as it would be impoſſible to enumerate all the variety of caſes that might occur, it is imagined that theſe will be ſufficient to give the reader an idea of the manner in which any building ought to be examined in this reſpect; and he muſt be left to his own diſcretion to apply the principles above explained to all the variety of caſes that may occur. In large complicated buildings, it no doubt requires a greater extent of thought to combine all the various circumſtances together, and draw a general concluſion, than in ſmaller and more ſimple ones; but if the following general rules are attended to, the complaints ariſing from this cauſe would be but few. 1ſt, Avoid as much as may be long paſſages leading to very diſtant parts of a building, as there is often a ſtrong current of air in theſe which helps to diſturb the free circulation of air up the chimneys. 2d, Place the chimneys in general in that ſide of the apartment *towards* which the wind which in general prevails moſt in the ſituation where the houſe is placed blows: And, 3d, make as many, if not more, doors and windows (eſpecially ſuch as have occaſion to be moſt frequently open) on that ſide of the building *from whence* the moſt prevalent wind does come.

IIId. The third general cauſe of ſmoke in houſes is the wrong

wrong position of the house with regard to external objects, which, by interrupting the course of the air, makes it assume various directions, and wheel about in eddies, so as to prevent it from ascending with ease from the chimney top, or beats it down into the room with violence. This is more seldom the cause of smoky houses than either of the two before mentioned; although it seems to be almost the only one attended to by the persons who pretend to cure smoky houses at present, as most of their remedies are adapted to remove the disorders arising from this cause alone. We shall briefly point out the several cases in which this can occur, that every one may be enabled to judge for himself when these cures are proper or not.

The air (as has been said) is a fluid, and wind a current of that fluid; which, when driven along the surface of the earth, flows with a smooth and equal stream, unless when opposed by some object which interrupts its course; but when it meets with any object which directly opposes its course, it is in some measure pushed back again, and made to spread on every side, till it meets with some open side, towards which it flows with great impetuosity. It is likewise a fluid of considerable gravity, and therefore presses upon the surface of the earth with great force; so that, when a current of it flows along the surface of our globe, it has a tendency to move forward and press downward at the same time: from whence it happens, that when a current of air is forced over the top of any high object, the side of which descends perpendicularly downward, the velocity of the current at first overcomes the gravity, and it flies a short way over in that direction; but the power of gravity acting upon the under surface, draws it downward, and in a short time overcomes the impetus that it had to rush forward, and occasions a sort of eddy nearly similar to what we see among water behind a stone which interrupts the violence of its currents.

To illustrate this more plainly, let AB, fig. 12. represent a part of a high building, near to which is a smaller one CD; and let the dotted line EF represent a current of air flowing with considerable force in the direction FE. It is plain that it will flow straight forward over the top of the small building; but when it meets with the large object, it will be interrupted in its course, and spread itself on every side, as represented by the dotted lines GG *&c.* at last it will flow towards that place through which it can escape with the greatest ease. If the opposing object be large, and has no opening through which it can issue near the ground, then it will ascend to the top of it, and flow off in that direction, carrying the smoke which ascends from the small chimney C along with it: but if there is any opening below, either a street or lane, or any other passage that will admit the wind to pass, then will the natural gravity of the air draw the general current downward to flow off through the lower passage; in which case, the smoke which ought to ascend through the chimney C, meeting with a current of air opposing its passage, will not be at liberty to issue forth, but be forced back again into the room from whence it proceed, unless some contrivance is fallen upon to prevent it.

Again, let A, fig. 13. represent a small building at the side of a great rock B, and the wind coming in the direction C D; when the current of air comes to the point D, being hurried forward with great velocity, it goes a little forward, but soon descends downward, and gradually is reflected more and more inward, as represented by the dotted lines E E, *&c.* so that, descending downwards upon the top of the chimney A, the smoke is beat back again into the apartments. Thus it is that low houses, when contiguous to high objects, are in danger of being disturbed with smoke. If the contiguous object be not very high, the disorder may be cured by heightening the chimney of the low house; but if it is very high, it will be necessary to cover the top of the chimney in such a manner as to prevent the wind from entering it, at the same time that a passage is left at some of the sides through which the smoke may issue with freedom. Many are the contrivances which have been invented for this purpose, which are to be met with every where; and as there is no difficulty in accomplishing the desired end by an infinite variety of methods, every one who needs such a thing may please his own fancy in the choice. We have thought it unnecessary to add any more but one kind of these, fig. 14. which will answer the end effectually.

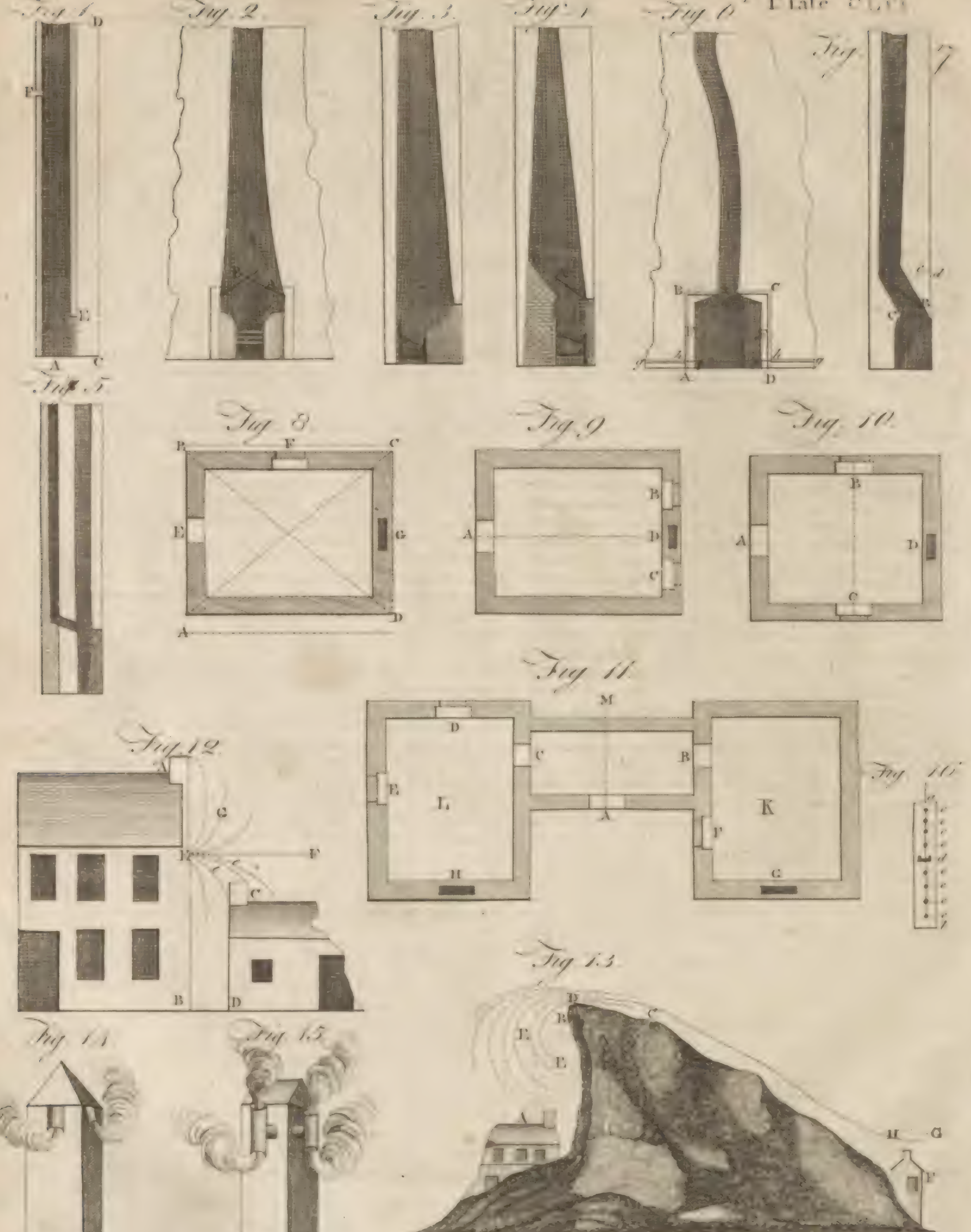
It is evident that houses situated near high hills, or thick woods, will be in some measure exposed to the same inconvenience; but it is likewise plain, that if a house be situated upon the slope of a hill, as at F, fig. 13. it will not be in any danger of smoke when the wind blows towards that side of the hill upon which it is situated; for the current of air coming over the house-top in the direction G H, is immediately changed by the slope of the hill to the direction H C, which powerfully draws the smoke upward from the top of the chimney. But it is also evident, that a house in this situation will be liable to smoke when the wind blows *from* the hill; for the current of air coming downward in the direction C H, will beat downward on the chimney F, and prevent the smoke from ascending with freedom. But the effect will be much heightened, if the doors and windows are chiefly in the lowermost side of the house.

These are some of the most general circumstances which prevent the free ascent of smoke, arising from external objects: but there are many other lesser causes which may at times occasion smoke, all of which it would be tedious here to enumerate; such as, blasts of air, reflected from the sides of mountains, and coming down valleys with great impetuosity, occasioning, in particular situations, eddies or whirlwinds of different sorts. In short, whatever in any measure disturbs the free motion of the air, is in danger of producing sudden gusts, which may occasion smoke. Therefore, whoever builds in a situation which is not altogether free, may lay his account with having some sudden gusts of smoke, unless he forms the top of his chimney so as to obviate it. And there are some situations so much exposed to sudden gusts of wind, sometimes whirling round, sometimes beat suddenly downward, or as suddenly carried up again, that it is difficult to guard against every danger. In these situations we would recommend something of the form of what is represented at fig. 15. which would be proof against every wind whatever.

Having thus traced the causes of smoky houses, and reduced them to distinct classes for the sake of distinctness; it is necessary, before we quit this subject, to observe, that in many cases, two or more of these may be combined to augment the malady, and therefore it is necessary to have all these circumstances in view in every particular case. It now only remains that we point out the several phenomena which may lead us to distinguish from which of these general causes the disorder complained of may proceed. And,

1st,

Plate CLVI



A. Bell Sc.

1ſt, If it is owing to a fault in the conſtruction of the chimney itſelf, it will ſmoke almoſt continually, eſpecially in calm weather.

2d, If it does not ſmoke in calm weather, or only when the wind comes from ſome particular quarter, and can then be cured by opening ſome door or window, the fault may be looked for in the diſtribution of the doors or windows of the houſe. The only caſe in which there is a difficulty to diſtinguiſh whether it is owing to the fault of the chimney or the houſe, is when it proceeds from too much cloſeneſs of the apartment. But this may be eaſily known by trying it in a calm: for if it proceeds from this cauſe, there will be no ſmoke in a perfect calm, if the doors are left open; whereas, if the defect proceeds from a fault in the chimney itſelf, it will ſtill continue to ſmoke when calm, even when the doors are open.

3d, When the ſmoke is occaſioned by external cauſes, theſe can be generally ſeen; but it may be likewiſe known by this, that it deſcends in ſudden puffs with great violence at times, even when the doors and windows are not altered. By attending to theſe few rules with care, there will be little danger of miſtaking the cauſe from whence this diſorder proceeds.

We ſhall conclude theſe obſervations with a few remarks on ſome particular caſes which can hardly be reduced to any of the foregoing heads. And,

1ſt, It ſometimes happens, that the ſmoke is prevented from aſcending with freedom, by having a ſmall part of the top of the chimney broke down, ſo as that ſome parts of it remain higher than others, which in ſome meaſure reduces it to the ſtate of a chimney at the ſide of a higher one. To prevent this, it is always proper to have the top of the chimney finiſhed with ſtones neatly cut, and firmly built. It is not to be doubted but that thoſe things which are placed upon particular chimneys with a view to cure them of ſmoke, do often, from the ſame cauſe, hurt the neighbouring chimneys built in the ſame wall.

2d, A chamber is ſometimes filled with ſmoke, when a fire is kindled in a neighbouring chimney, and none in it, although there is no appearance of ſmoke when it has a fire burning in its own grate. This may ſometimes proceed from a ſmall hole breaking through the thin partition that divides the two chimneys from one another, and as ſmoke is a weighty body, which is only buoyed up by the warm air which paſſes through the fire, when it penetrates into the cold chimney it naturally ſubſides, and comes down to the chamber with which the chimney communicates, when there is no fire to carry it off. But this diſeaſe is generally produced by the ſmoke entering at the top of the chimney, and deſcending downwards: if this laſt is the caſe, it may be cured, on many occaſions, by ſetting a pretty high ſtone at the top of the chimney, as a diviſion between each two: but the ſureſt method, in all caſes, is to have a ſmoke-board exactly fitted into the chimney above the grate, which on all occaſions effectually prevents it.

3d, It frequently happens, that a chimney does not carry off the ſmoke well at firſt when the fire is kindled, although there is not the ſmalleſt tendency to it at other times. This proceeds from the narrowneſs of the chimney; for when the fire is kindled, the whole tube is filled with cold air, as weighty as that in the appartment; and being expanded by the fire at the bottom, it endeavours to aſcend upward, but being pent in by the narrowneſs of the tube, and preſſed by the column of cold air above it, it is ſome time before it can wholly overcome that reſiſtance, and ſome of it is forced into the chamber, till by degrees the whole chimney is heated, and then it vents quite well. If the ſmoke produced by this means is not very troubleſome, it may be borne with; but if it be extremely diſagreable, it may be cured by having a large ſheet of milled iron, large enough to reach between the two ſides of the fire-place, and as deep as to reach from the mantle to the grate, or lower, which might by any contrivance be hung up before the fire at that time to act in ſome meaſure as a *ſmoke-chimney*. This would quickly make the fire burn, and carry of the ſmoke entirely. After that is effected, it might then be removed, till another occaſion.

SMOLENSKO, the capital of a province of the ſame name in Muſcovy, ſituated on the confines of Poland: in E. long. 33°, and N. lat. 56°.

SMUGGLERS, in law, thoſe perſons who conceal or run prohibited goods, or goods that have not paid his Majeſty's cuſtoms.

SMUT, in huſbandry, a diſeaſe in corn, when the grains, inſtead of being filled with flour, are full of a ſtinking black powder.

There are two remedies for the ſmut, recommended by writers on huſbandry; *viz.* ſteeping the ſeed in ſalt brine, and changing the ſeed.

As to the ſteeping of ſeed, when wheat is intended for drilling, it muſt be ſoaked in a brine of pure ſalt, diſſolved in water, ſince urine is found to be highly prejudicial. The moſt expeditious way of brining wheat for drilling, is to lay it in a heap, and waſh it with a ſtrong brine ſprinkled on it, ſtirring it up with a ſhovel, that it may be all equally brined, or wetted with it; after this, ſift on ſome fine lime all over the ſurface, and ſtir it up, ſtill ſifting on more in the ſame manner till the whole is duſted with the lime: it will then be ſoon dry enough to be drilled without farther trouble. It muſt be quick-lime, in its full ſtrength, that is uſed on this occaſion.

The bread made of ſmutty corn, is very pernicious, acting as a narcotic, and occaſioning not only ſleepineſs, but vertigoes, and even convulſions.

SMYRNA, a city and port-town of Aſiatic Turky, ſituated on a bay of the Archipelago, in the province of Ionia, in Leſſer Aſia, 100 miles north of Rhodes, and 200 miles nearly ſouth of Conſtantinople: E. long. 27°, N. lat. 37° 30'.

SMYRNIUM, in botany, a genus of the pentandria digynia claſs. The fruit is oblong, and ſtriated; and the petals are ſharp-pointed, and carinated. There are five ſpecies, only one of them, *viz.* the oluſatrum, or alexanders, a native of Britain.

SNAFFLE, in the manege, is a very ſlender bit-mouth, without any branches, much uſed in England; the true bridles being reſerved for the ſervice of war.

SNAIL, in zoology. See Limax.

SNAKE, in zoology. See Anguis.

Snake-root, in botany. See Polygala.

Snake-weed, in botany. See Polygonum.

SNAPDRAGON, in botany. See Antirrhinum.

SNEEZING, a convulſive motion of the muſcles of the breaſt, whereby the air is expelled from the noſe with much vehemence and noiſe.

Sneezing is cauſed by the irritation of the upper membrane

brane of the nose, occasioned by acrid substances floating in the air, or by medicines called sternutatories.

SNETHAM, a market-town of Norfolk, twenty-eight miles north-west of Norwick.

SNIPE, in ornithology. See TANTALUS.

SNOW, a meteor produced in this manner: When the vapours are become considerably condensed, yet not so far as to be liquified, or dissolved into water; then, by a special degree of coldness in the upper region of the air, the particles of the condensed vapour are changed into ice; several of which adhering together, form little fleeces of a white substance, somewhat heavier than the air; and therefore descend in a slow and gentle manner through it; being subject, by reason of its lightness, to be driven about by the various motions of the air and wind; and is what, when arrived to the surface of the earth, we call snow.

Snow fructifies the ground; for instance, by guarding the corn or other vegetables from the intenser cold of the air, especially the cold piercing winds.

SNOWDON-HILL, the highest mountain in Wales, situated in Caernarvonshire.

SNOW-DROP, in botany. See GALANTHUS.

SNUFF, a powder chiefly made of tobacco, the use of which is too well known to need any description here.

SOAL-FISH, in ichthyology. See PLEURONECTES.

SOAP, a kind of paste, sometimes hard and dry, and sometimes soft and liquid, much used in washing, whitening linens, and by dyers, fullers, *&c.* See CHEMISTRY, p. 93, 149, 154.

The purer hard soap is the only sort intended for internal use. This, triturated with oily or resinous matters, renders them soluble in water; and hence becomes an ingredient in pills composed of resins, promoting their dissolution in the stomach, and union with the animal fluids. Boerhaave always prescribed soap in resinous pills, unless where an alkalescent or putrid state of the juices forbad its use. From the same quality, soap seems well fitted for dissolving oily or unctuous matters and viscidities in the human body; thereby opening obstructions, and deterging all the vessels it passes through. It is likewise a powerful menstruum for the calculus, or stone in the bladder; a solution of it in lime-water being one of the strongest dissolvents that can with safety be taken into the stomach: the virtue of this composition is considerably greater than the aggregate of the dissolving powers of the soap and lime-water when unmixed.

SOCAGE, an ancient tenure, by which lands were held on condition of ploughing the lord's lands, and doing the operations of husbandry, at their own charges.

SOCCUS, in antiquity, a kind of high-shoe, reaching above the ancle, worn by comedians, as the cothurnus was by tragedians.

SOCIETY, in general, denotes a number of persons united together for their mutual assistance, security, interest, or entertainment.

The social principle in man is of such an expansive nature, that it cannot be confined within the circuit of a family, of friends, of a neighbourhood: it spreads into wider systems, and draws men into larger communities and commonwealths; since it is in these only, that the more sublime powers of our nature attain the highest improvement and perfection of which they are capable.

Royal SOCIETY, an academy or college, established by charter, by king Charles II. for promoting natural knowledge, and useful arts, by experiments.

It consists of several hundred fellows, or members, mostly British; some persons of the highest rank, and many eminent gentlemen and learned men of other nations. Their meetings are held once a week, at their house in Crane-Court, Fleet-street, London; where they discourse upon the productions and rarities of nature and art, and consider how the same may be improved for the good of mankind: here are also read letters, and other philosophical papers, sent by ingenious persons both at home and abroad; upon which they discourse in the plainest manner, without affecting studied speeches.

This society, of which his Britannic majesty is perpetual patron, is governed by a council of twenty-one members; ten of whom are yearly chosen out of the society, on St. Andrew's-day. The chief of the council bears the title of president, whose proper office is, to call and dissolve the meetings; to propose the matter to be debated; call for experiments; and admit such members as shall be elected, which must be by a majority of at least twenty-one votes; whereupon he is admitted, after paying 40 s. and subscribing that he will endeavour to promote the good of the Royal Society of London by the improvement of natural knowledge; and being thus admitted, he afterwards pays 13 s. a quarter, as long as he continues a member of the society.

SOCIETY *for the encouragement of arts, manufactures, and commerce.* The public spirit of this age is no-where more remarkably shewn, than in the flourishing condition of this valuable society, whose object is the improvement of the polite, useful, and commercial arts, in all their various branches, by exciting industry and emulation among all who can be stimulated by honorary or pecuniary rewards. It was set on foot in the year 1753, by the Lord Folkstone, Lord Romney, Dr Hales, and seven or eight private gentlemen, who were brought together by the unwearied pains of Mr William Shipley, who had long laboured to reduce into practice a scheme he had formed for this purpose This society, at their second meeting, determined to make a beginning, by proposing rewards for the discovery of cobalt, for the encouragement of boys and girls in the art of drawing, and for the planting of madder in this kingdom. And now money being wanted, a voluntary subscription was begun; soon after which a plan was drawn up for forming, regulating, and governing the society: and now the utility of such a society became so well understood, that immediately several noblemen and gentlemen offered themselves as members; and ever since that time, its increase has been so extraordinrry, that it consists of several thousand members, among whom are most of the nobility, and persons of large fortunes in the kingdom. The officers of this society are, a president, eight vice-presidents, a register, a secretary, and an assistant-secretary, who are all chosen by ballot annually on the first Tuesday in March. Every person desiring to be a member of this society must be proposed by three members: his name, addition, and place of abode, being read aloud by the secretary, he is ballotted for at the next meeting: he shall be deemed a perpetual member upon payment of twenty guineas, or a subscribing member upon payment of any sum not less than

than two guineas annually. Ladies are alſo admitted members, and foreigners are likewiſe admitted as honorary or correſponding members. The money of the ſociety is placed in the bank of England, in the name of the preſident and vice-preſidents, three of whom are empowered to draw any ſum the ſociety ſhall order, to be paid. The ſociety's office is oppoſite to Beauford buildings in the Strand, in London, where their meetings are held every Wedneſday evening, from the ſecond Wedneſday in November, to the laſt Wedneſday in May, and at other times every firſt and third Wedneſday of every month.

Society *for the reformation of manners*, and putting in execution the laws againſt immorality and profaneneſs. It was ſet on foot about forty years ago, by five or ſix private perſons in London, but is ſince exceedingly increaſed by numbers of all denominations. A particular body of the moſt conſiderable hereof, bear the expence of proſecutions, *&c.* without any contribution from the reſt. Theſe chiefly apply themſelves to the proſecuting people for ſwearing, drunkenneſs, and prophaning the ſabbath. Another body, of about fifty perſons, apply themſelves to the ſuppreſſing lewdneſs, and by them above five hundred lewd houſes have been actually ſuppreſſed; a third body conſiſts of conſtables; and a fourth of informers. Beſides theſe, there are eight other regular mixed bodies of houſe-keepers and officers, who inſpect the behaviour of the conſtables and other officers, aſſiſt in ſearching diſorderly houſes, ſeizing offenders, giving information, *&c.* There are ſeveral other ſocieties of this kind at Briſtol, Canterbury, Nottingham, *&c.*

Society *for propagating the goſpel in foreign parts*, was inſtituted by king William, in 1701, for ſecuring a maintenance for an orthodox clergy, and making other proviſions for the propagation of the goſpel in the plantations, colonies, frontiers, *&c.* To that end he incorporated the archbiſhops, ſeveral biſhops, and other nobility, gentry, and clergy, to the number of ninety, with privilege to purchaſe two thouſand pounds per year, inheritance and eſtates for lives or years, with other goods to any value. They meet yearly on the third Friday of February, to chuſe a preſident, vice-preſident, and other officers; and the third Friday in every month to tranſact buſineſs, depute fit perſons to take ſubſcriptions for the ſaid uſes, and of all moneys ſo received to give account to the lord chancellor, *&c.* They have a ſtanding committee at the chapter-houſe, to prepare matters for the monthly meeting which is held at St. Martin's library.

Society *for propagating Chriſtian knowledge.* This was begun in 1699 by ſome perſons of worth, *&c.* Its original deſign was to propagate religion in the plantations, to ſecure the pious education of the poor at home, and to reclaim thoſe that err in the fundamentals of Chriſtianity. In the year 1701, they had procured conſiderable charities, and tranſmitted the ſame to the plantations, in libraries, bibles, catechiſms, *&c.* with a voluntary maintenance for ſeveral miniſters to be employed in the plantations; but the ſociety for propagating the goſpel in foreign parts being then inſtituted, they were incorporated by charter in the ſame, and thus diſcharged as a particular ſociety from the further purſuit of that branch of their original deſign; whereupon they wholly turned themſelves to the other, and are now very conſiderable by great acceſſions from the clergy and laity. They meet weekly to concert meaſures for raiſing charity for educating poor children, and ſetting up ſchools for that purpoſe, as alſo for the more regular diſpoſal of books for the inſtruction of the ignorant, erroneous, *&c.*

For the other ſocieties eſtabliſhed by charter, ſee College, Company, Corporation, and Stocks.

Society, in Scots law. See Law, Tit. xxii. 5.

SOCII criminis, in Scots law. See Law, Tit. xxxiii. 50.

SOCINIANS, in church-hiſtory, a ſect of Chriſtian heretics, ſo called from their founder Fauſtus Socinus, a native of Sienna in Italy. He, about the year 1574, began openly to declare againſt the catholic faith, and taught, 1. That the eternal Father was the one only God; that the Word was no more than an expreſſion of the Godhead, and had not exiſted from all eternity; and that Jeſus Chriſt was God no otherwiſe than by his ſuperiority above all creatures who were put in ſubjection to him by the the Father. 2. That Jeſus Chriſt was not a mediator between God and men, but ſent into the world to ſerve as a pattern of their conduct. 3. That the puniſhment of hell will laſt but for a certain time, after which the body and ſoul will be deſtroyed. And, 4. That it is not lawful for princes to make war. Theſe four tenets were what Socinus defended with the greateſt zeal. In other matters, he was a Lutheran or a Calviniſt; and the truth is, that he did but refine upon the errors of all the antitrinitarians that went before him.

SOCOTORA, an iſland in the Indian ocean, about ſeventy miles long, and fifty broad: ſituate in E. long. 55°, N. lat. 11′

SOCRATIC philosophy, the doctrines and opinions, with regard to morality and religion, maintained and taught by Socrates. By the character of Socrates left us by the ancients, particularly by his ſcholar Plato, Laertius, *&c.* he appears to have been one of the beſt and the wiſeſt perſons in all the heathen world. To him is aſcribed the firſt introducing of moral philoſophy, which is what is meant by that uſual ſaying, "That Socrates "firſt called philoſophy down from heaven to earth;" that is, from the contemplation of the heavens and heavenly bodies, he led men to conſider themſelves, their own paſſions, opinions, faculties, duties, actions, *&c.* He wrote nothing himſelf; yet all the Grecian ſects of philoſophers refer their origin to his diſcipline, particularly the platoniſts, peripatetics, academics, cyrenaics, ſtoics, *&c.* but the greateſt part of his philoſophy we have in the works of Plato.

SODA, or Heat *of the ſtomach*, in medicine, the name of a diſtemper conſiſting in a heat or troubleſome burning about the pit of the ſtomach, or its left mouth which ſometimes is extended the whole length of the œſophagus, with a preſſure or ſpaſmodic conſtriction, uſually attacking the patient by fits. See Medicine.

SODBURY, a market-town of Glouceſterſhire, ſituated ten miles north-eaſt of Briſtol.

SODOMY, the unnatural crime of buggery, thus called from the city of Sodom, which was deſtroyed by fire for the ſame. The Levitical law adjudged thoſe guilty of this execrable crime to death, and the civil law aſſigns the ſame puniſhment to it. Our law alſo makes it felony.

There is no ſtatute in Scotland againſt ſodomy; the libel

libel of the crime is therefore founded on the divine law, and practice makes its punishment to be burning alive.

SOFA, in the Turkish customs, a bench of wood raised from the ground about a foot high, and placed round a hall or chamber for the people to sit down upon, or to lie along, and in that posture to take a view of what passes in the streets, *&c.* for these benches are surrounded with windows; they are covered with fine Tuky carpets; and upon that are placed cushions of sattin, flowered with gold or some other rich stuff.

SOFALA, the capital of the territory of that name in Africa, situated at the mouth of the river Sofala, in E. long. 35°, S. lat. 20°.

SOFFITA, or SOFFIT, in achitecture, any plafond or ceiling formed of cross beams of flying corniches, the square compartiments or pannels of which are enriched with sculpture, painting or gilding; such are those in the palaces of Italy, and in the apartments of Luxemburg at Paris.

SOFTENING, in painting, the mixing and diluting of colours with the brush or pencil.

SOGDIANA, a country of Asia, situated on the north side of the river Oxus, which separated it from the ancient Bactria, now a part of Usbec Tartary.

SOHAM, a market-town of Cambridgeshire, situated on a lake called Soham Meer, in the isle of Ely, fourteen miles north-east of Cambridge.

SOIL, in agriculture. See AGRICULTURE, p. 50.

SOISSONS, a city of France, in the province of the isle of France, situated on the river Ayse, fifty-five miles north-east of Paris.

SOL, the SUN, in astronomy, *&c.* See ASTRONOMY, p. 435.

SOL, in chemistry, is gold. See CHEMISTRY, p. 78.

SOL, in heraldry, denotes Or, the golden colour in the arms of sovereign princes.

SOLÆUS, in anatomy. See ANATOMY, p. 209.

SOLANUM, in botany, a genus of the pentandria monogynia class. The corolla is rotated; the antheræ are very close together, opening with a double pore at the points; and the berry has two cells. There are 30 species, two of them natives of Britain, *viz.* the nigrum, or common nightshade; and the dulcamara, or woody nightshade.

Common nightshade is used to allay inflammations.

Some years ago, the internal use of the solanum was much recommended by some writers, in cancerous cases, foul ulcers, and scorbutic eruptions: however, later experience has found this simple to be not only of little or no efficacy in such cases, but to be attended with actual danger to the patient.

SOLAR, something belonging to the sun. See ASTRONOMY, p. 435.

SOLDANELLA, in botany, a genus of the pentandria monogynia class. The corolla is bell-shaped, and split into many segments. There is but one species, a native of Switzerland.

SOLDER, a metallic or mineral composition used in soldering or joining together other metals.

Solders are made of gold, silver, copper, tin, bismuth, and lead; usually observing, that in the composition there be some of the metal that is to be soldered mixed with some higher and finer metals. Goldsmiths usually make four kinds of solder, *viz.* solder of eight, where to seven parts of silver there is one of brass or copper; solder of six, where only a sixth part is copper; solder of four, and solder of three. It is the mixture of copper in the solder that makes raised plate come always cheaper than flat. The solder used by plumbers is made of two pounds of lead to one of block-tin. Its goodness is tried by melting it, and pouring the bigness of a crown-piece upon a table; for if good, there will arise little bright shining stars therein. The solder for copper is made like that of the plumbers, only with copper and tin; for very nice works, instead of tin they sometimes use a quantity of silver. Solder for tin is made of two thirds of tin and one of lead: but where the work is any thing delicate, as in organ pipes, where the juncture is scarce discernable, it is made of one part of bismuth and three parts of pewter.

SOLDERING, among mechanics, the joining and fastening together two pieces of the same metal, or of two different metals, by the fusion and application of some metallic composition on the extremities of the metals to be joined. See the last article.

To solder upon silver, brass, or iron: take silver, five penny-weight; brass, four penny-weight; melt them together for soft solder, which runs soonest. Take silver, five penny-weight; copper, three penny-weight; melt them together for hard solder. Beat the solder thin, and lay it on the place to be soldered, which must be first fitted and bound together with wire, as occasion requires; then take borax in powder, and temper it like pap, and lay it upon the solder, letting it dry; then cover it with quick coals, and blow, and it will run immediately; take it presently out of the fire, and it is done. It is to be observed, that if any thing is to be soldered in two places, which cannot well be done at one time, you must first solder with the harder solder, and then with the soft; for if it be first done with the soft, it will unsolder again before the other is soldered. Let it be observed, that if you would have the solder run about the piece that is to be soldered, you must rub such places over with chalk.

In the soldering either of gold, silver, copper, and all the metals before-mentioned, there is generally used borax in powder, and sometimes rosin. As to iron, it is sufficient that it be heated red hot, and the two extremities thus hammered together, by which means they will become incorporated into one another.

SOLDIER, a military man listed to serve a prince or state, in consideration of a certain daily pay.

SOLE, in the manege, a nail or sort of horn under a horse's foot, which is much more tender than the other horn that incompasses the foot, and by reason of its hardness is properly called the horn or hoof.

SOLEA, in ichthyology. See PLEURONECTES.

SOLEÆ, among the Romans, a kind of sandals or slippers, which covered only the sole of the feet, and were bound on with thongs of leather, instead of which the women and the effeminate ones of the other sex tied them on with purple-coloured ribbons, or such as were variously adorned with gold and silver.

SOLECISM, in grammar, a false manner of speaking contrary to the use of language and the rules of grammar, either in respect of declension, conjugation, or syntax.

SOLEMNITIES OF DEEDS, in Scots law. See WRITINGS.

SOLEN, in zoology, a genus of insects belonging to the order

order of vermes testacea. The shell is oblong, bivalved, and opening at both sides; the cardo has a subulated reflected tooth, not inserted into the opposite valve. There are eleven species, distinguished by peculiarities in their shells.

SOLFAING, in musick, the naming or pronouncing the several notes of a song by the syllables *ut*, *re*, *mi*, *fa*, *sol*, &c. and in learning to sing it. See MUSICK.

SOLICITOR, a person employed to take care of, and manage suits depending in the courts of law or equity.

There is also a great officer of the law, next to the attorney-general, who is styled the king's solicitor-general; who holds his office by patent, during the king's pleasure has the care and concern of managing the king's affairs, and has fees for pleading, besides other fees arising by patents, *&c.* He hath his attendance on the privy-council; and the attorney-general and he were anciently reckoned among the officers of the exchequer; they have their audience, and come within the bar in all other courts.

SOLID, a body whose parts are so firmly connected together, as not to give way, or slip from each other upon the smallest impression; in which sense, solid stands opposed to fluid.

SOLIDAGO, in botany, a genus of the syngenesia polygamia superflua class. The receptacle is naked; the pappus is simple; the calix is imbricated with shut scales. There are twelve species, two of them natives of Britain. *viz.* the virgaurea, or common golden rod; and the cambrica, or Welch golden rod.

SOLIDITY, that property of matter, or body, by which it excludes all other bodies from that place which itself possesses. See METAPHYSICS.

SOLILOQUY, a reasoning or discourse which a man holds with himself; or, more properly, according to Papias, it is a discourse by way of answer to a question that a man proposes to himself.

Soliloquies are become very common things on the modern stage; yet can nothing be more unnatural, than an actor's making long speeches to himself, to convey his intentions to the audience. Where such discoveries are necessary to be made, the poet should rather take care to give the dramatic persons such confidents as may necessarily share their inmost thoughts, by which means they will be more naturally conveyed to the audience: yet is even this a shift an accurate poet would not be found to have occasion for.

SOLITARY, something retired or in private, remote from the company or commerce of others of the same species.

SOLITARIES, a denomination of nuns of St. Peter of Alcantara, instituted in 1576, the design of which is to imitate the severe penitent life of that saint: thus they are to keep a continual silence, never to open their mouths to any body but themselves; employ their time wholly in spiritual exercises, and leave the temporal concerns to a number of maids, who have a particular superior in a separate part of the monastery. They always go bare footed, without sandals, gird themselves with a thick cord, and wear no linen.

SOLMS, the capital of the county of Solms, in the landgraviate of Hesse-Cassel, in Germany, thirty-five miles north of Frankfort.

SOLO, in musick, a term used in pieces consisting of several parts, to mark those that are to perform alone.

SOLOMON's ISLANDS, a cluster of islands in the Pacific ocean, situated between 130° and 140° W. long. and between 7° and 12° S. lat.

SOLOMON's SEAL, in botany. See CONVALLARIA.

SOLOTHURN, one of the cantons of Switzerland, lying between those of Basil and Bern, the former on the north, and the latter on the south.

The city of Solothurn, capital of the said canton, is situated in E. long. 7° 15′, and N. lat. 47° 18′.

SOLSTICE, in astronomy, that time when the sun is in one of the solstitial points; that is, when he is at his greatest distance from the equator. See ASTRONOMY.

SOLVENT, the same with dissolvent. See DISSOLVENT.

SOLUTION, in chemistry, denotes an intimate mixture of solid bodies with fluids, so as seemingly to form one homogene liquor; the dissolving fluid is termed the dissolvent or menstruum. See CHEMISTRY, *passim*.

SOMERSETSHIRE, a county of England, situated on the Bristol channel, and bounded by Wiltshire on the east, by Dorsetshire on the south, and by Devonshire on the west: it is famous for the cloth manufacture.

SOMERTON, a market-town of Somersetshire, twelve miles south of Wales.

SOMME, a river of France, which running from east to west through Picardy, by Amiens and Abbeville, falls into the British channel near St. Vallery.

SOMNAMBULI, in medicine, persons who walk in their sleep, otherwise called noctambuli.

SON, an appellation given to a male child, considered in the relation he bears to his parents.

SONATA, in musick, a piece, or composition, intended to be performed by instruments only; in which sense, it stands opposed to cantata, or a piece designed for the voice.

SONCHUS, the SOW-THISTLE, in botany, a genus of the syngenesia polygamia æqualis class. The receptacle is naked; the calix is imbricated, and ventricose; and the pappus is plumose. There are ten species, three of them natives of Britain. *viz.* the oleraceus, or common sow-thistle; the arvensis, or tree sow-thistle; and the palustris, or marsh sow-thistle.

Sonchus is accounted cooling and attenuant, and accordingly prescribed in the stranguries, as also in inflammations of all kinds, to be applied externally in the form of a cataplasm.

SONG, in poetry, a little composition, consisting of easy and natural verses, set to a tune in order to be sung.

SONG, in musick, is applied in general to a single piece of musick, whether contrived for the voice or an instrument.

SONNA, a book of Mahometan traditions, wherein all the orthodox musselmen are required to believe.

SONNET, in poetry, a composition contained in fourteen verses, *viz.* two stanzas, or measures, of four verses each; and two of three; the eight first verses being all in three rhimes.

SONNITES, among the Mahometans, an appellation given to the orthodox musselmen, or true believers; in opposition to the several heretical sects, particularly the schiites, or followers of Ali.

SOOT, a volatile matter, arising from wood, and other fuel along with the smoke; or rather, it is the smoke itself, fixed and gathered on the sides of the chimney. See CHEMISTRY, p. 158. and AGRICULTURE, p. 49.

SOPHI,

SOPHI, a title given to the emperor of Perſia; importing as much as wiſe, ſage, or philoſopher. There is no prince in the world whoſe authority is more abſolute than that of the ſophi of Perſia.

SOPHISM, in logic, *&c.* an argument which carries much of the appearance of truth, and yet leads into error.

SOPHIST, a perſon who uſes ſophiſms, with a view to deceive thoſe he would perſuade or convince.

SOPHISTICATION, the adulterating any thing with what is not good or genuine; a practice too common in the making up medicines for ſale; as alſo among vintners, diſtillers, and others, who are accuſed of ſophiſticating their wines, ſpirits, oils, *&c.* by mixing with them cheaper and coarſer materials: and, in many caſes, the cheat is carried on ſo artfully as to deceive the beſt judges.

SOPHORA, in botany, a genus of the decandria monogynia claſs. The calix has five teeth, and is gibbous above; the corolla is papilionaceous, with the wings of the ſame length as the vexillum; and the capſule is a legumen. There are eight ſpecies, none of them natives of Britain.

SOPORIFIC MEDICINES, are thoſe capable of procuring ſleep, as opiates, *&c.* See OPIATES, *&c.*

SORBONNE, the houſe or college of the faculty of theology, in the univerſity of Paris; ſometimes alſo uſed for the faculty itſelf, becauſe it uſually aſſembles in the houſe of the ſorbonne.

SORBUS, in botany, a genus of the icoſandria trigynia claſs. The calix conſiſts of five leaves, and the corolla of five petals; and the berry contains three ſeeds. There are three ſpecies, two of them natives of Britain, *viz.* the domeſtica, or the true ſervice or ſorb; and the aucuparia, quicken-tree, or mountain-aſh.

SORCERY, the crime of witchcraft or divination by the aſſiſtance of an evil ſpirit. See WITCHCRAFT.

SORET, a province of the Hither India, lying northwards of Guzerat: its chief town is Jaganat.

SOREX, in zoology. See MUS.

SORITES, in logic, a ſpecies of reaſoning, in which a great number of propoſitions are ſo linked together, that the predicate of the one becomes continually the ſubject of the next following, till at laſt a concluſion is formed by bringing together the ſubject of the firſt propoſition and the predicate of the laſt. See LOGIC.

SORNERS, in Scots law. See LAW, Tit. xxxiii. 30.

SORREL, in botany. See RUMEX.

Wood SORREL, in botany. See OXALIS.

SORREL COLOUR, in the menage, is a reddiſh colour, generally thought to be a ſign of a good horſe.

SORRENTO, a city and port-town of the kingdom of Naples, eighteen miles ſouth of that city.

SORTILEGE, a ſpecies of divination, performed by means of ſortes or lots.

The ſortes preneſtinæ, famous in antiquity, conſiſted in putting a number of letters, or even whole words, into an urn; and then, after ſhaking them together, they were thrown on the ground, and whatever ſentences could be made out from them conſtituted the anſwer of the oracle.

Another kind of ſortes conſiſted in taking ſome celebrated poet, as Homer or Virgil; and, opening the book, whatever preſented itſelf firſt to the eye made the anſwer; and hence it got the name of ſortes homericæ, and ſortes virgilianæ, *&c.*

The ſuperſtitious among the ancient Chriſtians practiſed a ſimilar kind of divination, by opening the Old and New Teſtament; whence it got the name of ſortes ſanctorum.

SOTERIA, in antiquity, ſacrifices offered to the gods for delivering a perſon from danger; as alſo poetical pieces compoſed for the ſame purpoſe.

SOTOVENTO ISLANDS are ſituated on the coaſt of Terra-Firma; the chief of which are Trinidad, Margaretta, Tortuga, *&c.* They are alſo called the Leſſer Antilles.

SOUBISE, a town of Guienne, in France, ſituated on the river Charente, ſeventeen miles ſouth of Rochelle.

SOUGH, among miners, denotes a paſſage dug under ground, to convey off water from mines.

SOVEREIGN, in matters of government, is applied to the ſupreme magiſtrate, or magiſtrates, of an independent government or ſtate; by reaſon their authority is only bounded by the laws of God, of nature, and the fundamental laws of the ſtate: ſuch are kings, princes, *&c.*

SOUL, a ſpiritual ſubſtance, which animates the bodies of living creatures: it is the principle of life and activity within them.

Various have been the opinions of philoſophers concerning the ſubſtance of the human ſoul. The Carteſians make thinking the eſſence of the ſoul. Others again hold, that man is endowed with three kinds of ſouls, *viz.* the rational, which is purely ſpiritual, and infuſed by the immediate inſpiration of God; the irrational, or ſenſitive, which is common to man and brutes; and laſtly, the vegetative ſoul, or principle of growth and nutrition.

That the ſoul is an immaterial ſubſtance appears from hence, that its primary operations of willing and thinking have not only no connection with the known properties of body, but ſeem plainly inconſiſtent with ſome of its moſt eſſential qualities. For the mind diſcovers no relation between thinking and the motion and arrangement of parts.

As to the immortality of the human ſoul, the arguments to prove it may be reduced to the following heads: 1. The nature of the ſoul itſelf, its deſires, ſenſe of moral good and evil, gradual increaſe in knowledge and perfection, *&c.* 2. The moral attributes of God.

Under the former of theſe heads it is urged, that the ſoul, being an immaterial intelligent ſubſtance, does not depend on the body for its exiſtence; and therefore may, nay, and muſt, exiſt after the diſſolution of the body, unleſs annihilated by the ſame power which gave it a being at firſt. This argument, eſpecially if the infinite capacity of the ſoul, its ſtrong deſire after immortality, its rational activity and advancement towards perfection, be likewiſe conſidered, will appear perfectly concluſive to men of a philoſophical turn; becauſe nature, or rather the God of nature, does nothing in vain.

But arguments drawn from the latter head, *viz.* the moral attributes of the Deity, are not only better adapted to convince men unacquainted with abſtract reaſoning, but equally certain and concluſive with the former: for as the juſtice of God can never ſuffer the wicked to eſcape unpuniſhed, nor the good to remain always unrewarded; therefore, arguments drawn from the manifeſt and conſtant proſperity of the wicked, and the frequent unhappineſs of good men in this life, muſt convince every thinking perſon, that there is a future ſtate wherein all will

will be set right, and God's attributes of wisdom, justice, and goodness, fully vindicated. We shall only add, that had the virtuous and conscientious part of mankind no hopes of a future state, they would be of all men most miserable: but as this is absolutely inconsistent with the moral character of the Deity, the certainty of such a state is clear to a demonstration.

SOUND, a simple perception, or idea, communicated to the soul, by means of the ear, which is the primary organ of hearing. See ANATOMY, p. 295. and PNEUMATICS, p. 488.

SOUND, in geography, denotes in general any streight, or inlet, of the sea, between two head-lands. However, the name sound is given, by way of eminence, to the streight between Sweden and Denmark, joining the German ocean to the Baltic, being about four miles over.

SOUNDING, in navigation, is the trying the depth of the water, and the quality of the bottom, either by an inch or three-quarter rope, with a deep sea-lead at the end of it. See NAVIGATION.

SOUP, a kind of pottage made of bread and broth, or the juice of flesh, or some other matters, usually served at the beginning of a meal.

SOURIS, in the manege, is a cartilage in the nostrils of a horse, by means of which he snorts.

SOUTH, one of the four cardinal points from which the winds blow. See NAVIGATION, and PNEUMATICS.

SOUTHAM, a market town of Warwickshire, situated seven miles south-east of Warwick.

SOUTHAMPTON, a borough and port town of Hampshire, situated on a bay of the English channel, twelve miles south-west of Winchester. It sends two members to parliament.

SOUTHERN-WOOD, in botany. See ARTEMISIA.

SOUTHMOULTON, a market-town of Devonshire, situated twenty-four miles north-west of Exeter.

SOUTHPETHERTON, a market town of Somersetshire, situated twenty-two miles south of Wells.

SOUTHWARK, a borough of Surry, and a suburb to London with which it has a communication by a magnificent bridge. It is situated on the south side of the Thames, and sends two members to parliament.

SOUTHWELL, a market-town of Nottinghamshire, situated eight miles north-east of Nottingham.

SOUTHWOULD, a port-town of Suffolk, situated on a bay of the German Sea, forty-two miles east of Bury.

SOUVIGNY, a town of France, in the province of Lyonois, and territory of Bourbonois, situated fifty miles south-east of Bourges.

SOW, in zoology. See SUS.

SOW, in the iron-works, the name of the block or lump of metal they work at once in the iron furnace.

SOWING, in agriculture. See AGRICULTURE, p. 59.

SPAW, a town of Germany, in the circle of Westphalia, and bishopric of Liege, situated seventeen miles south east of Liege, famous for its mineral waters ever since the time of the Romans, of which there are still great quantities sent abroad to all parts of Europe.

Spaw waters are the lightest and most subtile of all the mineral waters. One very remarkable virtue of this water is, that it greatly relieves in all disorders of the kidneys, ureters, and bladder, whether occasioned by stone, gravel, or ulcerations. It possesses, beside, all the virtues of the other mineral waters, and is of the greatest service in edulcorating sharp, and dividing viscuous humours, and removing all diseases arising from these causes, by disposing them to pass off by proper emunctories.

SPACE is defined by Mr Locke to be a simple idea which we attain both by our sight and touch; the modes whereof are distance, capacity, extension, duration, *&c.* See METAPHYSICS.

SPACE, in geometry, denotes the area of any figure, or that which fills the interval or distance between the lines that terminate it.

SPAGIRIC ART, a name given by authors to that species of chemistry which works on the metals, and is employed in the search of the philosopher's stone.

SPAHI'*s*; horsemen in the Ottoman army, chiefly raised in Asia. The great strength of the grand seignior's army consists in the janizaries who are the foot, and the spahi's, who are the horse.

SPAIN, including Portugal, is a large peninsula of Europe, lying between 10° west and 3° east longitude, and between 30° and 44° north latitude, being about seven hundred miles in length from east to west, and about five hundred in breadth from north to south: it is bounded by the bay of Biscay, on the north; by the Pyrenean mountains, which separate it from France, on the north-east; by the Mediterranean sea, on the south east; and by the Atlantic-ocean, on the west.

New SPAIN. See MEXICO.

SPALATRO, a city and port-town of Dalmatia, situated on the gulph of Venice: E. long. 17° 45′, N. lat. 43° 16′.

SPALDING, a market-town of Lincolnshire, situated under the meridian of London, thirty miles south-east of Lincoln.

SPAN, a measure taken from the space between the thumb's end and the tip of the little finger, when both are stretched out. The span is estimated at three hand's breadths, or nine inches.

SPANDAW, a town of Germany, in the circle of Upper Saxony, and Marquisate of Brandenburg, situated on the river Havel, eight miles north-west of Berlin.

SPANIEL, in zoology. See CANIS.

SPAR, in natural history, a class of fossils, not inflammable nor soluble in water; when pure, it is pellucid and colourless, and emulating the appearance of crystal, but wanting its distinguishing characters; composed of plane and equable plates, not flexile nor elastic, not giving fire with steel, readily calcining in a small fire, and fermenting violently with acids, and wholly soluble in them.

The spars, in general, are found in the fissures of stones, and about mines. Derbyshire affords enough of them to supply the whole world; and the German mines afford yet larger quantities.

SPARADRAPUM, in pharmacy, *&c.* a sort of cere-cloth, called also tela Gualteri, the form whereof is directed as follows. Take of the diapalma plaister, and diachylon with the gums, each one pound; ceruss, half a pound; root of oris finely powdered, an ounce and a half. Mix these together; and whilst they are in fusion, dip them in soft worn-out linen-rags, so that they may be covered with the plaister on each side; then take them out, spread them, and let them dry; and smoothe the surfaces with

a knife or ſpatula. The principal uſe of theſe is for iſſues.

SPARGANIUM, in botany, a genus of the monœcia triandria claſs. The amentum of both male and female is roundiſh; and the calix of both conſiſts of three leaves; neither of them have any corolla; the ſtigma of the female is bifid; and the drupa is dry, and contains two ſeeds. There are two ſpecies, both natives of Britain, *viz.* the erectum, or great-bur-reed; and the natans, or leaſt bur-reed.

SPARROW, in ornithology. See FRINGILLA.

SPARROW-HAWK, in ornithology. See FALCO.

SPARTIUM, in botany, a genus of the diadelphia decandria claſs. The ſtigma is longitudinal, and downy above; the filaments adhere to the carina; and the calix is longeſt on the back part. There are 10 ſpecies, only one of them, *viz.* the ſcoparcium, or common broom, a native of Britain.

SPARTIVENTO CAPE, the moſt ſouthern point or promontory of Italy: ſituated in E. long. 16° 30′, N. lat. 38° 20′.

SPARUS, in ichthyology, a genus belonging to the order of thoracici. The fore-teeth and dog-teeth are very ſtrong; the grinders are obtuſe, and thick ſet; the lips are folded over; there are five rays in the gill-membrane, and the opercula are ſcaly; the body is compreſſed; the lateral line is crooked behind; and the pectoral fins are roundiſh. There are 26 ſpecies.

SPASM, in medicine, a convulſion.

A ſpaſm, according to Hoffman, may be univerſal or particular, ſalutary or morbous. An univerſal ſpaſm happens if the whole vaſcular genus, chiefly the heart and arteries, as alſo the fibres of the ſyſtem, are affected, and there is a preternatural conſtriction therein, whereby the ſyſtole and diaſtole are increaſed, and the progreſs of the blood accelerated; this conſtitutes a fever, whereof a frequent pulſe is the moſt certain ſign. See MEDICINE.

SPASMODIC, ſomething belonging to a ſpaſm or convulſion. See the laſt article.

SPATHA, in botany. See BOTANY, p. 636.

SPAVIN, in the manege, a diſeaſe in horſes, being a ſwelling or ſtiffneſs, uſually in the ham, occaſioning a lameneſs. See FARRIERY, p. 572.

SPAYING, or SPADING, the operation of caſtrating the females of ſeveral kinds of animals, as ſows, bitches, *&c.* to prevent any further conception, and promote their fattening.

It is performed by cutting them in the mid flank, on the left-ſide, with a ſharp knife or lancet, taking out the uterus and cutting it off, and ſo ſtitching up the wound, anointing the part with tar, and keeping the animal warm for two or three days. The uſual way is to make the inciſion aſlope two inches and a half long, that the forefinger may be put in towards the back to feel for the ovaries, which are two kernels as big as acorns on both ſides of the uterus, one of which is drawn to the wound, the ſtring thereof cut, and thus both taken out.

SPEAKER *of the houſe of commons*, a member of the houſe, elected by a majority of the votes thereof, to act as chairman or preſident in putting queſtions, reading briefs or bills, keeping order, reprimanding the refractory, adjourning the houſe, *&c.* See PARLIAMENT.

SPEAKING, the art or act of expreſſing one's thoughts in articulate ſounds or words.

SPECIAL, ſomething that is particular, or has a particular deſignation; from the Latin *ſpecies*, in oppoſition to general from *genus*.

SPECIES, in logic, a relative term, expreſſing an idea which is compriſed under ſome general one called a genus, See LOGIC and METAPHYSICS.

SPECIES, in optics, the image painted on the retina, by the rays of light reflected from the ſeveral points of the ſurface of an object.

SPECIES, in commerce, are the ſeveral pieces of gold, ſilver, copper, *&c.* which having paſſed their full preparation and coinage are current in public. See MONEY.

SPECIFIC, in philoſophy, that which is peculiar to any thing, and diſtinguiſhes it from all others.

SPECIFIC, in medicine, a remedy whoſe virtue and effect is peculiarly adapted to ſome certain diſeaſe, is adequate thereto, and exerts its whole force immediately thereon.

SPECIFICATION, in Scots law. See LAW, Tit. viii. 7.

SPECTACLES, in dioptrics, a machine conſiſting of two lenſes, ſet in ſilver, horn, *&c.* to aſſiſt the defects of the organ of ſight.

Old people, and others who have flat eyes, uſe convex ſpectacles, which cauſe the rays of light to converge ſo as to fall upon the retina: whereas myopes, or ſhort-ſighted perſons, uſe concave lenſes for ſpectacles, which cauſing the rays to diverge, prevent their meeting ere they reach the retina. See OPTICS.

SPECULARIS LAPIS, in natural hiſtory, a genus of talcs compoſed of large plates viſibly ſeparate, and of extreme thinneſs; and each fiſſile again ſeparated into a number of plates ſtill finer.

Of this genus there are three ſpecies. 1. The white ſhining ſpecularis, with large and broad leaves, commonly called iſing-glaſs and Muſcovy-glaſs: its lamellæ, or leaves, are extremely thin, elaſtict, and tranſparent; it makes not the leaſt effervеſcence with aqua-fortis, and is not eaſily calcined in the fire. It is imported in great quantities: the miniature painters cover their pictures with it; the lantern-makers ſometimes uſe it inſtead of horn; and minute objects are uſually preſerved between two plates of it, for examination by the microſcope. 2. The bright brown ſpecularis, with broad leaves; a very valuable ſpecies, though inferior to the former. 3 The purple bright ſpecularis, with broad leaves; which is the moſt elegant of all the talcs, and not leſs beautifully tranſparent than the firſt kind.

SPECULATIVE, ſomething relating to the theory of ſome art or ſcience, in contradiſtinction to practical

SPECULUM, A LOOKING GLASS, or MIRROUR, capable of reflecting the rays of the ſun, *&c.* See OPTICS.

SPECULUM, in ſurgery, an inſtrument for dilating a wound, or the like, in order to examine it attentively. See SURGERY.

SPEECH, in general, the art or act of expreſſing a perſon's thoughts, by means of articulate ſounds, which we call words. See LANGUAGE and GRAMMAR.

SPEEDWELL, in botany. See VERONICA.

SPELL, in general, denotes the ſame with charm or amulet. See CHARM and AMULET.

SPELLING, in grammar, that part of orthography which teaches

teaches the true manner of refolving words into their fyllables. See GRAMMAR.

SPERGULA, in botany, a genus of the decandria pentagynia clafs. The calix confifts of five leaves, and the corolla of five entire petals ; the capfule is oval, with one cell and five valves. There are five fpecies, three of them natives of Britain, *viz.* the arvenfis, or corn-fpurrey; the pentandria, or fmall fpurrey ; and the nodofa, or knotted fpurrey.

SPERM. See SEED.

SPERMA-CETI, a white flaky fubftance, prepared from the oil of a fpecies of whale, called phyfeter macrocephalus. See PHYSETER.

SPERMACOCE, in botany, a genus of the tetrandria monogynia clafs. The corolla confifts of one funnel-fhaped petal ; and it has two bidentated feeds. There are fix fpecies, none of them natives of Britain.

SPERMATIC, in anatomy, fomething belonging to the fperm or feed. See ANATOMY, p. 270.

SPEY, a river of Scotland, which, running north-eaft, through Badenoch and Murray, falls into the German fea, eaft of the frith of Murray.

SPHACELUS, in furgery and medicine, an abfolute and perfect corruption or death of the parts. See MEDICINE and SURGERY.

SPHÆRANTHUS, in botany, a genus of the fyngenefia polygamia fegregata clafs. The receptacle is naked ; it has no pappus ; the calix is imbricated. There are two fpecies, none of them natives of Britain.

SPHAGNUM, in botany, a genus of the cryptogamia mufcorum clafs. The antheræ are operculated, and there is no calyptra. The fpecies are three, all natives of Britain, *viz.* the paluftre, or grey bog-mofs ; the alpinum, or mountain bog-mofs ; and the arboreum, or creeping bog-mofs.

Os SPHENOIDES, in anatomy. See ANATOMY, p. 158.

SPHERE, is a folid contained under one uniform round furface, fuch as would be formed by the revolution of a circle about a diameter thereof, as an axis. See GEOMETRY, and ASTRONOMY.

SPHEROID, in geometry, a folid, approaching to the figure of a fphere.

The fpheroid is generated by the entire revolution of a femi-ellipfis about its axis.

SPHINCTER, in anatomy, a term applied to a kind of circular mufcles, or mufcles in form of rings, which ferve to clofe and draw up feveral orifices of the body, and prevent the excretion of the contents.

SPHINX, in fculpture, *&c.* a figure or reprefentation of a monfter of that name, famed among the ancients, now moftly ufed as an ornament in gardens, terraces, *&c.* It is reprefented with the head and breafts of a woman, the wings of a bird, the claws of a lion, and the reft of the body like a dog.

SPICA VIRGINIS, a ftar of the firft magnitude, in the conftellation virgo. See ASTRONOMY, p. 487.

SPICE, any kind of aromatic drug that has hot and pungent qualities : fuch are pepper, nutmeg, ginger, cinnamon, cloves, *&c.*

SPICE-ISLANDS fituated in the Eaft Indies. See BANDA, MOLUCCA-ISLANDS, and CEYLON.

SPIDER, in zoology. See ARANEA.

SPIDER-WORT, in botany. See PHALANGIUM.

SPIEL, in the glafs-trade, an iron inftrument, hooked at the end, and pointed, with which the workmen take the metal up out of the melting-pots, for proofs or effays, to fee whether it be fit for work.

SPIGELBURG, a town of Germany, in the circle of Weftphalia, capital of the county of Spigelburg: E. long. 9° 25′, N. lat. 52° 6′.

SPIGELIA, in botany, a genus of the pentandria monogynia clafs. The corolla is funnel-fhaped ; and the capfule has two cells, and containing many feeds.

SPIKE, or *oil of* SPIKE, a name given to an effential oil diftilled from lavender, and much ufed by the varnifh-makers and the painters in enamel.

SPIKENARD, in botany. See NARDUS.

Ploughman's SPIKENARD, in botany. See CONYZA.

SPILIMBERGO, a town of Italy, in the territory of Venice, and province of Friuli : fituated forty-five miles north of Venice.

SPILSBY, a market-town of Lincolnfhire: fituated twenty-feven miles eaft of Lincoln.

SPINA VENTOSA, in furgery, that fpecies of corruption of the bones which takes its rife in the internal parts, and by degrees enlarges the bone, and raifes it into a tumour. See SURGERY.

SPINACHIA, in botany, a genus of the diœcia pentandria clafs. The calix of the male confifts of five fegments, and that of the female of four; neither of them have any corolla ; the ftyli are four ; and there is one hard feed within the calix. The fpecies are two, none of them natives of Britain.

SPINAL MARROW. See ANATOMY, p. 288.

SPINALIS in anatomy, the names of feveral mufcles, *&c.* See ANATOMY, p. 195 *&c.*

SPINE, SPINA DORSI, in anatomy. See ANATOMY, p. 166.

SPINET, or SPINNET, a mufical inftrument, ranked in the fecond or third place among harmonious inftruments.

SPINNING, the act or art of reducing filk, flax, hemp, wool, hair, or other matters, into thread. Spinning is either performed on the wheel with a diftaff and fpindle, or with other machines proper for the feveral kinds of working. Hemp, flax, nettle-thread, and the like vegetable matters, are to be wetted in fpinning ; filks, wools, *&c.* are to be fpun dry, and do not need water ; but there is a way of fpinning filk as it comes off the cafes or balls, where hot and even boiling water is to be ufed.

SPINOZISM, the doctrine of Spinoza, or atheifm and pantheifm propofed after the manner of Spinoza, who was born a Jew at Amfterdam.

The great principles of Spinozifm, is, that there is nothing properly and abfolutely exifting befides matter and the modifications of matter ; among which are even comprehended thought, abftract and general ideas, comparifons, relations, combinations of relations, *&c.*

The chief articles in Spinoza's fyftem are reducible to thefe. That there is but one fubftance in nature ; and that this only fubftance is endued with an infinite number of attributes, among which are extenfion and cogitation: that all the bodies in the univerfe are modifications of this fubftance confidered as it is extended and that all the fouls of men are modifications of the fame fubftance confidered as cogitative : that God is a neceffary and infinitely perfect Being, and is the caufe of all things that exift,

exift, but not a different being from them: that there is but one being and one nature, and that this nature produces within itfelf, by an immanent act, all thofe which we call creatures; and that this being is at the fame time both agent and patient, efficient caufe and fubject, but that he produces nothing but modifications of himfelf.

SPIRÆA, in botany, a genus of the icofandria pentagynia clafs. The calix confifts of five fegments, and the corolla of five petals; and the capfule contains many feeds. There are eleven fpecies, none of them natives of Britain.

SPIRAL, in geometry, a curve line of the circular kind, which, in its progrefs, recedes from its center.

SPIRAL, in architecture and fculpture, implies a curve that afcends, winding about a cone or fpire, fo as all the points thereof continually approach the axis. It is diftinguifhed from the helix, by its winding around a cone, whereas the helix winds in the fame manner around a cylinder.

SPIRE, in architecture, was ufed by the ancients for the bafe of a column, and fometimes for the aftragal or tore. But among the moderns, it denotes a fteeple that continually diminifhes as it afcends, whether conically or pyramidally.

SPIRE, in geography, an imperial city of Germany, capital of a bifhopric of the fame name, and fituated in the palatinate of the Rhine, fifteen miles fouth-weft of Heidelburg: E. long. 8° 17′, N. lat. 49° 16′.

SPIRIT, in metaphyfics, an incorporeal being or intelligence; in which fenfe, God is faid to be a fpirit, as are angels and the human foul.

SPIRITS, or ANIMAL SPIRITS, in phyfiology. See ANATOMY, p. 253, and ÆTHER.

SPIRIT, in chemiftry, a name applied to feveral very different fubftances. However, in general, it denotes any diftilled volatil liquor that is not infipid, as phlegm, or pure water, not inflammable as oil: but under this general idea are comprehended liquors of quite oppofite natures, fome being acid, and others alkaline; which laft are fuch enemies to the former, that as foon as they are put together, they raife a violent effervefcence, and grow hot: and to thefe may be added a third fort, called vinous or inflammable fpirits; which, though very fubtile or penetrating, are not manifeftly either acid or alkaline. See CHEMISTRY, p. 69, 95, 161, &c.

SPIRITUAL, in general, fomething belonging to, or partaking of, the nature of fpirit. See SPIRIT.

SPIRITUALITIES *of a bifhop*, are the profits he receives as a bifhop, and not as a baron of parliament: fuch are the duties of his vifitation, prefentation money, what arifes from the ordination and inftitution of priefts, the income of his jurifdiction, &c.

SPITHEAD, a road between Portfmouth and the ifle of Wight, where the Royal navy of Great Britain frequently rendezvous

SPITTLE, in phyfiology. See SALIVA.

SPITZBERGEN. See GROENLAND.

SPLACHNUM, in botany, a genus of the cryptogamia mufci clafs. The calix of the male flower is a fmooth conic calyptra; the antheræ are cylindric; and the receptacle coloured, membranaceous, and very large. There are four fpecies, only one of them, *viz.* the ampullaceum, or common fplachnum, a native of Britain.

SPLEEN, in anatomy See ANATOMY, p. 266.

SPLEEN-WORT. See ASPLENIUM

SPLENETIC, a perfon affected with obftruction of the fpleen.

SPLENIUS, in anatomy. See ANATOMY, p. 216.

SPLENT, or SPLINT, among farriers, a callous, infenfible excrefcence, breeding on the fhank bone of horfes. See FARRIERY, p. 573.

SPLICING, in the fea-language, is the untwifting the ends of two cables or ropes, and working the feveral ftrands into one another by a fidd, fo that they become as ftrong as if they were but one rope.

SPODIUM, in pharmacy, one of the fouleft recrements of copper.

SPOILS, whatever is taken from the enemy in time of war.

Among the ancient Greeks, the fpoils were divided in common among the whole army; only the general's fhare was largeft: but among the Romans, the fpoils belonged to the republic.

SPOLETTO, the capital of Umbria, in Italy: it is fituated fifty miles north-eaft of Rome

SPONDEE, in ancient poetry, a foot confifting of two long fyllables; as, *omnes*.

SPONDIAS, in botany, a genus of the decandria pentagynia clafs. The calix has five teeth, and the corolla five petals; and the drupa has five cells. There are two fpecies, both natives of America.

SPONGIA, in zoology, a genus belonging to the order of vermes zoophyta. The whole texture is a congeries of bibulous cells. There are fix fpecies, all found in the bottom of the fea, and fubmarine rocks. Spunges are much ufed by furgeons, and others, for fucking up fuperfluous moifture; which they eafily part with by preffure

SPONSORS, among Chriftians, are thofe perfons, who, in the office of baptifm, anfwer or are fureties for the perfons baptized.

SPONTANEOUS, a term applied to fuch motions of the body, and operations of the mind, as we perform of ourfelves, without any conftraint.

SPOON-BILL, in ornithology. See PLATEA.

SPOONING, in the fea-language, is faid of a fhip, which, being under fail in a ftorm at fea, is unable to bear it, and confequently forced to put right before the wind.

SPORADES, among ancient aftronomers, a name given to fuch ftars as were not included in any conftellation.

SPORADIC DISEASES, among phyficians, are fuch as feize particular perfons at any time or feafon, and in any place; in which fenfe they are diftinguifhed from epidemical and endemic difeafes.

SPOTS, in aftronomy, certain places of the fun's or moon's difc, obferved to be either more bright, or darker, than the reft; and accordingly, called fæculæ and maculæ. See ASTRONOMY.

SPOUT, or WATER-SPOUT, an extraordinary and dangerous meteor, obferved at fea, and fometimes at land, called by the Latins typho and fipho. Its firft appearance is in form of a deep cloud, the upper part of which is white, and the lower black: then from the lower part of this cloud hangs, or rather falls down, what is properly called the fpout, in form of a conical tube, biggeft at top; and under this tube, there is always a great boiling,

boiling and flying up of the water of the ſea, as in a *jet d'eau*. For ſome yards above the ſurface of the ſea, the water ſtands as a column or pillar, from the extremity whereof it ſpreads and goes off, as in a kind of ſmoke. Frequently, the cone deſcends ſo low, as to touch the middle of this column, and continue for ſome time contiguous to it; though ſometimes it only points to it, at ſome diſtance, either in a perpendicular or oblique line. Frequently it is ſcarce diſtinguiſhable whether the cone or the column appear the firſt, both appearing all of a ſudden againſt each other. But ſometimes the water boils up from the ſea to a great height, without any appearance of a ſpout pointing to it, either perpendicularly or obliquely. Indeed, generally, the boiling or flying up of the water has the priority, this always preceding its being formed into a column. Generally, the cone does not appear hollow, till towards the end, when the ſea-water is violently thrown up along its middle, as ſmoke up a chimney. Soon after this, the ſpout or canal breaks and diſappears; the boiling up of the water, and even the pillar, continuing to the laſt, and for ſome time afterwards; ſometimes till the ſpout form itſelf again, and appear anew; which it ſometimes does ſeveral times in a quarter of an hour.

M. de la Pyme, from a near obſervation of two or three ſpouts in Yorkſhire, deſcribed in the Philoſophical Tranſactions, gathers, that the water-ſpout is nothing but a gyration of clouds by contrary winds, meeting in a point or centre; and there, where the greateſt condenſation and gravitation is, falling down into a pipe or great tube, ſomewhat like Archimedes's ſpiral ſcrew; and, in its working and whirling motion, abſorbing and raiſing the water, in the ſame manner as the ſpiral ſcrew does; and thus deſtroying ſhips, *&c.*

SPRAT, in ichthyology. See CLUPEA.

SPRING, in natural hiſtory, a fountain or ſource of water, riſing out of the ground. See HYDROSTATICS.

SPRING, in mechanics, denotes a thin piece of tempered ſteel, or other elaſtic ſubſtance; which, being wound up, ſerves to put ſeveral machines in motion by its elaſticity, or endeavour to unbend itſelf: ſuch is the ſpring of a clock, watch, and the like.

SPRING-TIDE. See ASTRONOMY, p. 473, *&c.*

SPUNGE. See SPONGIA.

SPUNGING, in gunnery, the cleaning a gun's inſide with a ſpunge, in order to prevent any ſparks of fire from remaining in her, which would endanger the life of him who ſhould load her again.

SPUN YARN, among ſailors, is a kind of line made from rop yarn, and uſed for ſeizing or faſtening things together.

SPUR, a piece of metal, conſiſting of two branches encompaſſing a horſeman's heel, and a rowel in form of a ſtar, advancing out behind to prick the horſe.

SPURGE, in botany. See EUPHORBIA.

SPURGE LAUREL. See DAPHNE.

SPURKETS, in a ſhip, ſpaces between the upper and lower futtocks, or betwixt the rungs fore and aft.

SPURRY, in botany. See SPERGULA.

SPUTUM, among phyſicians, denotes the ſame with the ſaliva or ſpittle. See SALIVA.

SPY, a perſon hired to watch the actions, motions, *&c.* of another; particularly of what paſſes in a camp. When a ſpy is diſcovered, he is hanged immediately.

SQUADRON, in military affairs, denotes a body of horſe whoſe number of men is not fixed; but is uſually from one to two hundred.

SQUADRON *of ſhips*, a diviſion or part of a fleet, commanded by a vice-admiral, or commodore.

SQUALUS, the SHARK KIND, in ichthyology, a genus belonging to the order of amphibia nantes. There are five ſpiracula, one on each ſide of the neck; the body is oblong, and ſomewhat cylindrical; and the mouth is ſituate in the anterior part of the head. There are 15 ſpecies, all inhabitants of the ocean.

SQUAMARIA, in botany. See LATHRÆA.

SQUAMOUS, in anatomy, an appellation given to the ſpurious or falſe ſutures of the ſkull, becauſe compoſed of ſquamæ or ſcales like thoſe of fiſhes. See ANATOMY, p. 152.

SQUARE, in geometry, a quadrilateral figure, both equilateral and equiangular. See GEOMETRY.

SQUARE ROOT. See ARITHMETICK, p. 420.

Hollow SQUARE, in the military art, is a body of foot drawn up with an empty ſpace in the middle for the colours, drums, and baggage; faced and covered by the pikes every way, to keep off horſe.

SQUARE, an inſtrument conſiſting of two rules, or branches, faſtened perpendicularly at one end of their extremes, ſo as to form a right angle: it is of great uſe in the deſcription and menſuration of right angles, and laying down perpendiculars.

SQUATINA. See SQUALUS.

SQUILL, in botany. See SCILLA.

SQUINTING. See STRABISMUS.

SQUIRREL, in zoology. See SCIURUS.

STABLE, a place or houſe for horſes, *&c.* furniſhed with ſtalls and proper apartments to contain their food, *&c.*

STACHYS, in botany, a genus of the didynamia gymnoſpermia claſs. The upper labium is vaulted, and the inferior one reflected in the edges; the intermediate labium being largeſt, and emarginated; and the ſtamina are reflected towards the ſides. There are 12 ſpecies, three of them natives of Britain, *viz.* the germanica, or baſe hore-hound; the ſilvatica, or hedge nettle; and the paluſtris, or clown's all heal.

STADIUM, an ancient Greek long meaſure.

Stadium was alſo the courſe or career wherein the Greeks ran their races.

STADTHOLDER, the principal governor or magiſtrate of the United Provinces.

The ſtadtholder ſeems to be impowered, either directly or by his influence, to change both the deputies, magiſtrates, and officers, in every province and city. He is preſident in the ſtates of every province, though he has not ſo much as a ſeat or vote in the ſtates-general: but as he influences the ſtates of each province to ſend what deputies he pleaſes to the ſtates-general, he has, in effect, the appointing the perſons that conſtitute the ſtates-general, and may be deemed ſovereign of the united provinces. The ſtadtholders had once a very great power. We find one of their ſtadtholders appointing what towns ſhould ſend deputies or members to the aſſembly of the ſtates of Holland: but the ſtadtholderſhip was never hereditary till now, when in the year 1747 it was made ſo in the family of Orange.

It is obſerved, that the ſtates paſſed by the ſtadtholder's eldeſt ſon, and appointed his younger ſon prince Maurice of Orange their ſtadtholder; and at other times they have ſuppreſſed the ſtadtholderſhip entirely. The ſtadtholder always in the council of ſtate, when the votes happen to be equal, has a deciſive voice.

STAEHELINA, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the pappus is feathered; and the calix is imbricated with ſcales, membranaceous, coloured, and reflected at the points. There are two ſpecies, none of them natives of Britain.

STAFF, an inſtrument ordinarily uſed to reſt on in walking. The ſtaff is alſo frequently uſed as a kind of natural weapon both of offence and defence, and for ſeveral other purpoſes.

Staff, in muſick, five lines on which with the intermediate ſpaces the notes of a ſong or piece of muſick are marked.

STAFFORD, the county-town of Staffordſhire, is ſituated one hundred and thirty miles north-weſt of London. It ſends two members to parliament.

STAG, in zoology. See Cervus.

STAGE, in the modern drama, the place of action and repreſentation, included between the pit and the ſcenes, and anſwering to the proſcenium or pulpitum of the ancients.

STAGGERS. See Farriery, p. 552.

STAINES, a town of Middleſex, ſituated nineteen meaſured miles weſt of London.

STAIR-CASE, in architecture, an aſcent incloſed between walls, or a balluſtrade, conſiſting of ſtairs, or ſteps, with landing-places and rails, ſerving to make a communication between the ſeveral ſtories of a houſe. See Architecture, p. 360.

STALACTITÆ, in natural hiſtory, cryſtalline ſpars formed into oblong, conical, round, or irregular bodies, compoſed of various cruſts, and uſually found hanging in form of icicles from the roofs of grottos, &c.

STALBRIDGE, a market-town of Dorſetſhire, ſituated eighteen miles north of Dorcheſter.

STALK, in botany, that part of a plant which riſes immediately from the root, and which ſupports the leaves of the flowers and the fruit.

STALLION, or stone-horse, in the menage, an ungelt horſe, deſigned for the covering of mares, in order to propagate the ſpecies. See Equus.

STAMFORD, a borough-town of Lincolnſhire, ſituated thirty-five miles ſouth of Lincoln. It ſends two members to parliament.

STAMINA. See Botany, p. 635.

Stamina, in the animal body, are defined to be theſe ſimple original parts, which exiſted firſt in the embryo, or even in the ſeed; and by whoſe diſtinction, augmentation, and accretion, by additional juices, the animal body, at its utmoſt bulk, is ſuppoſed to be formed.

STAMINEOUS, in botany, a term for thoſe flowers of plants which have no petals or flower-leaves, but conſiſt only of a number of ſtamina and piſtils placed in a cup.

STAMP-duties, certain impoſitions laid on all parchment and paper, on which deeds, grants, or other inſtruments, or any proceſs in law or equity, are ingroſſed or written. Theſe duties, when firſt granted, were from forty ſhillings for letters-patent, &c. to ſixpence for the uſual deeds; and one penny for declarations, pleadings, &c. They have been, in general, doubled and trebled, by ſubſequent ſtatutes; and the common ſtamp now is the treble ſixpenny. Perſons writing or engroſſing any thing charged with the duty on parchment or paper, before it is ſtamped, or if it be marked with any lower duty than what is required, are liable to forfeit 5 l.; and the deed ſhall not be deemed good in law, till ſuch penalty is paid, and the ſame be ſtamped, &c.

STAMPALIA, an iſland of the Archipelago, about fifty miles in circumference, ſituated in E. long. 26° 30′, and N. lat. 36° 20′.

STANCHION, or Stanchions, in a ſhip, thoſe pillars, which being ſet up pillar-wiſe, do ſupport and ſtrengthen the waſte-trees.

STAND, in commerce, a weight, from two hundred and a half to three hundred, of pitch.

STANDARD, in war, a ſort of banner, or flag, borne as a ſignal for the joining together of the ſeveral troops belonging to the ſame body. See Flag, &c.

Standard, in commerce, the original of a weight, meaſure, or coin, committed to the keeping of a magiſtrate, or depoſited in ſome public place, to regulate, adjuſt, and try the weights uſed by particular perſons in traffick. See Money.

STANDON, a town of Hertfordſhire, ſituated under the meridian of London, and ſeven miles north of Hertford.

STANHOPE, a market-town of Durham, ſituated ſixteen miles weſt of Durham.

STANLEY, a town of Glouceſterſhire, ſituated twelve miles ſouth of Glouceſter.

STANNARIES, the mines and works where tin is dug and purified, as in Cornwal, Devonſhire, &c. There are four courts of the ſtannaries in Devonſhire, and as many in Cornwal; and great liberties were granted them by ſeveral acts of parliament in the time of Edward I. &c. though ſomewhat abridged under Edward III. and Charles I.

STANNUM, tin. See Chemistry, p. 83, 135.

STANTON, a town of Lincolnſhire, ſituated ſeventeen miles eaſt of Lincoln, under the meridian of London.

STANZA, in poetry, a certain ſtated number of verſes, generally containing a perfect ſenſe, that ought to end with ſome lively and ingenious thought, or juſt and pertinent reflection.

STAPELIA, in botany, a genus of the pentandria digynia claſs of plants. The plant is contorted, with a double ſtar-like nectarium covering the fructification. There are two ſpecies, both natives of the Cape of Good Hope.

STAPES, in anatomy. See Anatomy, p. 296.

STAPHYLÆA, in botany, a genus of the pentandria trigynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; the capſules are inflected and connate; and there are two globular ſeeds. There are two ſpecies, both natives of the Cape of Good Hope.

STAPHYLINUS, in zoology, a genus of inſects belonging to the order of coleoptera: the antennæ are ſlender; the elytra are dimidiated, and cover the wings; and the tail is ſimple, and furniſhed with two oblong bladders. There are 17 ſpecies, principally diſtinguiſhed by their colour

STAPLE primarily ſignifies a public place or market, whither

ther merchants, &c. are obliged to bring their goods to be bought by the people, as the Greve, or the places along the Seine, for ſale of wines and corn, at Paris, whether the merchants of other parts are obliged to bring thoſe commodities.

Formerly the merchants of England were obliged to carry their wool, cloth, lead, and other like ſtaple-commodities of this realm, in order to utter the ſame by wholeſale; and theſe ſtaples were appointed to be conſtantly kept at York, Lincoln, Newcaſtle upon Tyne, Norwich, Weſtminſter, Canterbury, Chicheſter, Wincheſter, Exeter, and Briſtol; in each whereof a public mart was appointed to be kept, and each of them had a court of the mayor of the ſtaple, for deciding differences, held according to the law-merchant, in a ſummary way.

STAR, in aſtronomy. See ASTRONOMY, *paſſim*.

Falling STARS, in meteorology, fiery meteors, which dart through the ſky, in form of a ſtar; being occaſioned by a nitro-ſulphureous matter, the common cauſe of all ſuch meteors.

STAR, in heraldry, a charge frequently borne on the ſhield, and the honourable ordinaries, in figure of a ſtar; which differs only from the mullet, in not being pierced as this laſt is. See MULLET.

STAR, is alſo a badge of honour, worn by the knights of the garter, bath, and thiſtle. See GARTER.

STAR *of Bethlehem*, in botany. See ORNITHOGALUM.

STAR-BOARD, in the ſea-language, denotes the right-hand ſide of a ſhip: thus they ſay, ſtar-board the helm, or helm a ſtar-board, when he that conds would have the men at the helm, or ſteering-wheel, put the helm to the right-ſide of the ſhip.

STAR-CHAMBER, a chamber at Weſtminſter, ſo called from having its roof painted with gilt ſtars, wherein the chancellor, aſſiſted by others appointed for that purpoſe, formerly had authority to puniſh routs, riots, and other miſdemeanors that were not by the common law provided againſt.

STAR-FISH. See ASTERIAS

STAR-SHOT, a gelatinous ſubſtance frequently found in fields, and ſuppoſed by the vulgar to have been produced from the meteor called a falling ſtar; but, in reality, is the half-digeſted food of herons, ſea-mews, and the like birds; for theſe birds, when ſhot, have been found, when dying, to diſgorge a ſubſtance of the ſame kind.

STAR-STONE, in natural hiſtory, a name given to certain extraneous foſſile ſtones, in form of ſhort, and commonly ſomewhat crooked, columns, compoſed of ſeveral joints; each reſembling the figure of a radiated ſtar, with a greater or ſmaller number of rays in the different ſpecies: they are uſually found of about an inch in length, and of the thickneſs of a gooſe-quill. Some of them have five angles, or rays, and others only four, and in ſome the angles are equi-diſtant, while in others they are irregularly ſo; in ſome alſo they are ſhort and blunt, while in others they are long, narrow, and pointed; and ſome have their angles ſo very ſhort and obtuſe, that at firſt ſight they might be taken for entrochoaſteriæ. The ſeveral joints in the ſame ſpecimen are uſually all of the ſame thickneſs; this however is not always the caſe, but in ſome they are larger at one end and in others at the middle, than in any other part of the body; and ſome ſpecies have one of the rays bifid; ſo as to emulate the appearance of a ſix-rayed kind.

STAR-THISTLE. See CENTAUREA.

STAR-WORT. See ASTER.

STARCH, a fecula, or ſediment, found at the bottom of veſſels wherein wheat has been ſteeped in water; of which fecula, after ſeparating the bran from it, by paſſing it through ſieves, they form a kind of loaves, which being dried in the ſun or an oven, is afterwards cut into little pieces, and ſo ſold. The beſt ſtarch is white, ſoft, and friable, and eaſily broken into powder. Such as require fine ſtarch do not content themſelves, like the ſtarch-men, with refuſe wheat, but uſe the fineſt grain. The proceſs is as follows: The grain being well cleaned is put to ferment in veſſels full of water, which they expoſe to the ſun while in its greateſt heat, changing the water twice a-day, for the ſpace of eight or twelve days, according to the ſeaſon. When the grain burſts eaſily under the finger, they judge it ſufficiently fermented. The fermentation perfected, and the grain thus ſoftened, it is put, handful by handful, into a canvas bag, to ſeparate the flour from the huſks, which is done by rubbing and beating it on a plank laid acroſs the mouth of an empty veſſel that is to receive the flour.

As the veſſels are filled with this liquid flour, there is ſeen ſwimming at the top rediſh water, which is to be carefully ſcummed off from time to time, and clean water is to be put in its place; which, after ſtirring the whole together, is alſo to be ſtrained through a cloth or ſieve, and what is left behind put into the veſſel with new water, and expoſed to the ſun for ſome time. As the ſediment thickens at the bottom, they drain off the water four or five times, by inclining the veſſel, but without paſſing it through the ſieve. What remains at bottom is the ſtarch, which they cut in pieces to get out, and leave it to dry in the ſun. When dry, it is laid up for uſe.

STARGARD, a town of Germany, in the circle of Upper-Saxony, and duchy of Pomerania, ſituated twenty miles eaſt of Stetin.

STARIA, a city of Ruſſia, in the province of Great Novogorod, ſituated at the ſouth end of the Ilmen-lake: E. long. 34° 2′, N. lat. 58°.

STARLING. See STURNUS.

START-POINT, a cape or promontory of Devonſhire, in the Engliſh channel, twelve miles ſouth of Dartmouth.

STATE, or ESTATE, an empire, kingdom, province, or extent of country under the ſame government.

STATEN-ISLAND, an iſland of the province of New York, in North America, ſituated near the mouth of Hudſon's river: in W. long. 72° 31′, N. lat. 41°.

STATERA ROMANA, or STEEL-YARD, a name given to the Roman balance.

STATES, or ESTATES, a term applied to ſeveral orders or claſſes of people aſſembled to conſult of matters for the public good.

Thus ſtates-general is the name of an aſſembly conſiſting of the deputies of the ſeven United Provinces: theſe are uſually thirty in number, ſome provinces ſending two, others more; and whatever reſolution the ſtates-general take, muſt be confirmed by every province, and by every city and republic in that province, before it has the force of a law. The deputies of each province, of what number ſoever they be, have only one voice, and are eſteemed

as

was but one perſon, the votes being given by provinces. Each province preſides in the aſſembly in its turn, according to the order ſettled among them. Guelderland preſides firſt, then Holland, *&c.*

States of Holland are the deputies of eighteen cities, and one repreſentative of the nobility, conſtituting the ſtates of the province of Holland: the other provinces have likewiſe their ſtates, repreſenting their ſovereignty, deputies from which make what they call the ſtates-general. In an aſſembly of the ſtates of a particular province, one diſſenting voice prevents their coming to any reſolution.

STATICE, in botany, a genus of the pentandria trigynia claſs. The calix is one entire plaited leaf; the corolla conſiſts of five petals; it has but one ſeed. There are 14 ſpecies, three of them natives of Britain, *viz.* the armeria, or ſea gilly-flower; the limonium, or ſea-lavender; and the reticulata, or matted ſea-lavender.

STATICS, that branch of mathematics which conſiders the motion of bodies ariſing from gravity. See HYDROSTATICS, and MECHANICS.

STATION, in geometry, ſurveying, *&c.* a place pitched upon to make an obſervation, take an angle, or the like.

STATIONARY, in aſtronomy, ſignifies the appearance of a planet, when it ſeems to remain immoveable on the ſame point of the zodiac for ſeveral days. See ASTRONOMY.

STATIONARY-DAYS, in church-hiſtory, an appellation given to the weekly faſt-days, *viz.* Wedneſdays, and Fridays; otherwiſe called half-faſts, and faſts of the fourth and ſixth days of the week.

Theſe faſts are certainly as ancient as Clemens Alexandrinus and Tertullian, who both mention them; and the reaſon of their inſtitution is, becauſe on the fourth day of the week the Jews took council to put our Saviour to death, which was actually accompliſhed on the ſixth: however, being in continual uſe throughout the year, they were not kept with ſuch rigour and ſtrictneſs as Lent. See the article LENT.

STATIVA, among the Romans, a ſtanding camp kept for the defence of the frontiers of the empire. Theſe camps gave riſe to a great many towns, which took their names from the legion ſtationed there.

STATUARY, a branch of ſculpture, employed in the making of ſtatues. See SCULPTURE, and the next article.

Statuary is one of thoſe arts wherein the ancients ſurpaſſed the moderns; and indeed it was much more popular, and more cultivated, among the former than the latter.

STATUE, is defined to be a piece of ſculpture in full relievo, repreſenting a human figure.

Statues are formed with the chiſſel of ſeveral matters, as ſtone, marble, plaſter, *&c.* They are alſo caſt of various kinds of metals, particularly gold, ſilver, braſs, and lead.

Every ſtatue, reſembling the perſon it is intended to repreſent, is called *ſtatua iconica.* Statues acquire various other denominations. 1. Thus allegorical ſtatue, is that which, under a human figure, or other ſymbol, repreſents ſomething of another kind, as a part of the earth, a ſeaſon, age, element, temperament, hour, *&c.* 2. Curule ſtatues, are thoſe which are repreſented in chariots drawn by bigæ, or quadrigæ, that is, by two or four horſes; of which kind there were ſeveral in the circuſes, hippodromes, *&c.* or in cars, as we ſee ſome, with triumphal arches, on antique medals. 3. Equeſtrian ſtatue, that which repreſents ſome illuſtrious perſon on horſe-back, as that famous one of Marcus Aurelius, at Rome; that of king Charles I. at Charing-croſs, king George II. in Leiceſter-ſquare, London; king Charles II. in the Parliament-cloſe, Edinburgh; king William III. at the croſs, Glaſgow; *&c.* 4. Greek ſtatue, denotes a figure that is naked and antique; it being in the manner the Greeks repreſented their deities, athletæ of the olympic games, and heroes: ſtatues of the heroes were particularly called Achillean ſtatues, by reaſon of the great number of figures of that prince in moſt of the cities of Greece. 5. Hydraulic ſtatue, is any figure placed as an ornament of a fountain or grotto, or that does the office of a jet d'eau, a cock, ſpout, or the like, by any of its parts; the like is to be underſtood of any animal ſerving for the ſame uſe. 6. Pedeſtrian ſtatue, a ſtatue ſtanding on foot; as that of king George II. in the royal infirmary, Edinburgh; that of king Charles II. in the royal-exchange, London; and of king James II. in the privy-Gardens. 7. Roman ſtatue, is an appellation given to ſuch as are cloathed, and which receive various names from their various dreſſes. Thoſe of emperors, with long gowns over their armour, were called *ſtatuæ paludatæ:* thoſe of captains and cavaliers, with coats of arms, *thoracatæ:* thoſe of ſoldiers, with cuiraſſes, *loricatæ:* thoſe of ſenators and augurs, *trabeatæ:* thoſe of magiſtrates, with long robes, *togatæ:* thoſe of the people, with a plain tunica, *tunicatæ:* and laſtly, thoſe of the women, with long trains, *ſtolatæ.* The Romans had another diviſion of ſtatues into divine, which were thoſe conſecrated to the gods, as Jupiter, Mars, Apollo, *&c.*; Heroes, which were thoſe of the demi-gods, as Hercules, *&c.*; and Auguſti, which were thoſe of the emperors, as thoſe two of Cæſar and Auguſtus under the portico of the capitol. In repairing a ſtatue caſt in a mould, they touch it up with a chiſſel, graver, or other inſtrument, to finiſh the places which have not come well off: they alſo clear off the barb, and what is redundant in the joints and projectures.

STATURE, the ſize or height of a man.

STATUTE, in its general ſenſe, ſignifies a law, ordinance, decree, *&c.* See LAW, *&c.*

Statute, in our laws and cuſtoms, more immediately ſignifies an act of parliament made by the three eſtates of the realm: and ſuch ſtatutes are either general, of which the courts at Weſtminſter muſt take notice, without pleading them; or they are ſpecial and private, which laſt muſt be pleaded.

STAVANGER, a port-town of Norway, in the province of Bergen, capital of the territory Stavenger, ſituated on a peninſula in the German ocean: E. long. 6° 30′, N. lat. 59° 30′.

STAVEREN, a port-town of the United-Netherlands, in the province of Weſt Frieſland, ſituated on the Zuyder-ſea: E. long. 5° 12′, N. lat. 53°.

STAY, in the ſea-language, a big ſtrong rope faſtened to the top of one maſt, and to the foot of that next before it towards the prow, ſerving to keep it firm, and prevent its falling aftwards or towards the poop.

STEADY, a word of command at ſea, for the man at the helm to keep the ſhip ſteady in her courſe, and not to make angles (or yaws, as they call them) in and out.

STEATITES, in the hiſtory of foſſils, a name given by late

late authors, to a ſubſtance called, in Engliſh, ſoap-earth. Dr Woodward much recommends it as a ſubſtance for making porcelain; and repeated trials of it have been made ſince his time, and ſome of them very lately; in all which it has afforded the fineſt earthen-ware ever made with us, and promiſes fair, with good management, for the equalling any in the world. It is dug in many parts of Devonſhire and Cornwall, and the neighbouring counties; the cliff of the Lizard-point is almoſt wholly compoſed of it, and the adjacent little iſlands abound with it; and from all theſe places it might be brought, at a ſmall expence, in any quantities. It is known from all other earths by theſe characters: it is compoſed of extremely fine particles; and is of a firm, equal and regular texture, and a great weight. It is very firm and hard as it lies in the earth. but when it has been ſome time expoſed to the air, it becomes almoſt of a ſtony hardneſs. It is of a perfectly fine, ſmooth, and gloſſy ſurface, ſofter to the touch than any other ſpecies of earth, and does not at all adhere to the tongue, or ſtain the fingers in handling; but drawn along a rough ſurface, as a piece of cloth, or the like, it marks it with a fine and even white line. In colour it is a clear white, veined and variegated very beautifully with purple of different degrees of deepneſs; and is of ſo fine a ſtructure of parts, that when cut into thin pieces, it is in ſome degree tranſparent. It makes no effervеſcence with acids, and burns to a pure white, even in its purple parts.

STEATOMA, a kind of encyſted tumour, conſiſting of a matter like ſuet or lard, ſoft, without pain, and without diſcolouring the ſkin.

STEEL, a kind of iron refined and purified by the fire with other ingredients. See CHEMISTRY, p. 134.

STEEL GLASSES, a name given by ſome authors to the metalline ſpheres uſed in optics. Theſe, according to Cardan, are made of three parts of braſs, one part of tin, and one of ſilver, with an eighteenth part of antimony; but moſt either totally leave out the ſilver, or add only a twenty-fourth part, to ſave the expence. There are many other methods, directed by ſeveral authors; but moſt uſe arſenic and tartar mixed with the metals. Theſe are afterwards to be poliſhed with emery, rotten-ſtone, putty, and the like.

STEEL-YARD. See MECHANICS.

STEEPLE, an appendage erected generally on the weſtern end of a church, to hold the bells. Steeples are denominated from their form, either ſpires or towers: the firſt are ſuch as aſcend continually diminiſhing either conically or pyramidically; the latter are mere parallelopipeds, and are covered a top platform-like.

STEERAGE, on board a ſhip, that part of the ſhip next below the quarter-deck, before the bulk-head of the great cabbin, where the ſteerſman ſtands in moſt ſhips of war. See the next article.

STEERING, in navigation, the directing a veſſel from one place to another by means of the helm and rudder. He is held the beſt ſteerſman who cauſes the leaſt motion in putting the helm over to and again, and who beſt keeps the ſhip from making yaws, that is, from running in and out. See NAVIGATION.

STEEVE, on board a ſhip. The ſeamen ſay the bowſprit or the beak-head of a ſhip ſteeves, when it ſtands too upright, or not ſtraight enough foreward.

STEGANIUM. See SLATE.

STEGANOGRAPHY, the art of ſecret writing, or of writing in cyphers known only to the perſons correſponding.

STEGEBURG, a port-town of Sweden, in the province of Eaſt Gothland, ſituated on a bay of the Baltic: E. long. 16°, N. lat. 58° 30′.

STEGNOTICS, in medicine, remedies proper to cloſe and ſtop the orifices of the veſſels or emunctories when relaxed, ſtretched, lacerated, &c. ſuch as pomegranate-leaves and roſes, plaintain-leaves, tormentil-roots, &c.

STELLATE, among botaniſts, expreſſes leaves which grow not leſs than ſix at a joint, and are arranged like the rays of a ſtar.

STELLERA, in botany, a genus of the octandria monogynia claſs. It has no calix, the corolla conſiſts of four ſegments; the ſtamina are very ſhort; and there is but one roſtrated ſeed. There are two ſpecies, none of them natives of Britain.

STELLIONATE, in Scots law. See LAW, Tit. xxxiii. 36.

STEM, in botany, that part of a plant ariſing out of the root, and which ſuſtains the leaves, flowers, fruits, &c.

STEM *of a ſhip*, that main piece of timber which comes bending from the keel below, where it is ſcarfed, as they call it; that is, pieced in; and riſes compaſſing right before the forecaſtle. This ſtem it is which guides the rake of the ſhip, and all the butt-ends of the planks are fixed into it. This, in the ſection of a firſt-rate ſhip, is called the main ſtem.

STEMPLES, in mining, croſs-bars of wood in the ſhafts which are ſunk to mines. In many places the way is to ſink a perpendicular hole or ſhaft, the ſides of which they ſtrengthen from top to bottom with wood-work, to prevent the earth from falling in: the tranſverſe pieces of wood uſed for this purpoſe, they call ſtemples; and by means of theſe the miners, in ſome places, deſcend without uſing any rope, catching hold of theſe with their hands and feet.

STENOGRAPHY, the art of writing ſhort-hand. See SHORT-HAND WRITING.

STENONIAN DUCT, in anatomy. See ANATOMY, p. 307.

STEP *of the maſt and capſtan*, in a ſhip, is that piece of timber whereon the maſts or capſtans do ſtand at bottom.

STEPHEN, or *St.* STEPHEN'S DAY, a feſtival of the Chriſtian church, obſerved on the 26th of December, in memory of the firſt martyr St. Stephen.

STERCULIA, in botany, a genus of the monœcia monodelphia claſs. The calix both of male and female conſiſts of five ſegments; neither of them have any corolla; the male has 15 filaments; the germen reſts upon a column; and there are five capſules containing many ſeeds. There are two ſpecies, both natives of India.

STEREOGRAPHIC PROJECTION, is the projection of the circles of the ſphere on the plane of ſome one great circle, the eye being placed in the pole of that circle.

STEREOGRAPHY, the art of drawing the forms and figures of the ſolids upon a plane.

STEREOMETRY, that part of geometry which teaches how to meaſure ſolid bodies, *i. e.* to find the ſolidity or ſolid content of bodies, as globes, cylinders, cubes, veſſels, ſhips, &c. See GEOMETRY.

STEREOTOMY, the art or act of cutting ſolids, or making

king sections thereof, as walls or other members in the profiles of architecture.

STERILITY, the quality of a thing that is barren, in opposition to fertility.

Nature has annexed sterility to all monstrous productions, that all the creation might not degenerate. Hence the sterility of mules, *&c.*

STERLING, a term frequent in British commerce. A pound, shilling, or penny sterling, signifies as much as a pound, shilling, or penny of lawful money of Great Britain, as settled by authority. See MONEY.

STERN *of a ship*, usually denotes all the hindermost part of her, but properly it is only the outmost part abaft.

STERNBERG, a town of Germany, in the circle of Upper Saxony and marquisate of Brandenburg, situated twenty-three miles north-east of Frankfort upon the Oder.

STERNOHYOIDÆUS, in anatomy. See ANATOMY, p. 223.

STERNUM, in anatomy. See ANATOMY, p. 175.

STERNUTATORY, a medicine proper to produce sneezing. Sternutatives are of two kinds, gentle and violent. Of the first kind are betony, sage, marjoram, tobacco, and the whole fashionable tribe of snuffs. Of the latter kind are euphorbium, white bellebore, pellitory, *&c.*

STETIN, a city and port-town of Germany, in the circle of Upper Saxony, capital of the duchy of Pomerania, situated on the west shore of the river Oder: E. long. 14° 50′, N. lat 53° 30′.

STEVENAGE, a market-town of Hertfordshire, situated thirty miles north of London, and ten north-west of Hertford.

STEW, a small kind of fish-pond, the peculiar office of which is to maintain fish, and keep them in readiness for the daily use of the family *&c.*

STEWS, were also places anciently permitted in England to women of professed incontinency, for the proffer of their bodies to all comers. These were under particular rules and laws of discipline, appointed by the lord of the manor.

STEWARD, an officer appointed in another's stead or place, and always taken for a principal officer within his jurisdiction. Of these there are various kinds. The greatest officer under the crown is the lord high steward of England, an office that was anciently the inheritance of the earls of Leicester, till forfeited by Simon de Mountfort to king Henry III. But the power of this officer is so very great, that it has not been judged safe to trust it any longer in the hands of a subject, excepting only *pro hac vice*, occasionally; as, to officiate at a coronation, at the arraignment of a nobleman for high-treason or the like. During his office, the steward bears a white staff in his hand; and the trial, *&c.* ended, he breaks the staff, and with it his commission expires. There is likewise a lord steward of the king's household, who is the chief officer of the kings court, has the care of the king's house, and authority over all the officers and servants of the household, except such as belong to the chapel, chamber, and stable.

STEWART, in Scots law. See LAW, Tit. iv. 5.

STEWARTEA, in botany, a genus of the monadelphia polyandria class. The calix is simple; the stigma is quinquefid; the berry has five lobes, and one seed. There is but one species, a native of Virginia.

STEYNING, a borough-town of Suffolk: situated forty miles south of London, and thirteen miles west of Lewes. It sends two members to parliament.

STIBIUM, or ANTIMONY. See CHEMISTRY, p. 87, 139.

STICKLEBACK, in ichthyology. See GASTEROSTEUS.

STIGMA, in botany. See BOTANY, p. 637.

STIGMATA, the apertures in different parts of the bodies of insects, communicating with the tracheæ, or air-vessels, and serving for the office of respiration.

STIGMATA, in antiquity, certain marks impressed on the left shoulders of the soldiers when listed.

STIGMATIZING, among the ancients, was inflicted upon slaves, as a punishment, but more frequently as a mark to know them by, in which case it was done by applying a red-hot iron marked with certain letters to their foreheads, till a fair impression was made, and then pouring ink into their furrows, that the inscription might be the more conspicuous.

STILE. See STYLE.

STILES, in carpentry, denote the upright pieces which go from the bottom to the top of any wainscot, or the like.

STILLATITIOUS OILS, such as are produced by distillation, in opposition to those got by infusion, expression, *&c.*

STILL-BOTTOMS, in the distillery, a name given by the traders to what remains in the still after the working the wash into low wines. These bottoms are procured in the greatest quantity from the malt-wash, and are of so much value to the distiller, in the fattening of hogs, *&c.* that he often finds them one of the most valuable articles of the business.

STIMULATING, a property in bodies, whereby they vellicate and cause vibrations and inflections of the fibres of the nerves, and a greater derivation of nervous fluid into the parts affected. Stimulants produce pain, heat, redness, *&c.*

STING, an apparatus in the body of certain insects, in form of a little spear, serving them as a weapon of offence. See APIS.

STINT, in zoology. See ALAUDA.

STIPA, in botany, a genus of the triandria digynia class. The calix consists of two valves, containing one flower; the exterior valve of the corolla terminates in an awn; and it is jointed at the base. There are seven species, only one of them, *viz.* the pennata, or feather-grass, a native of Britain.

STIPEND, among the Romans, signified the same with tribute; and hence stipendiarii were the same with tributarii.

STIPEND, in Scots law. See LAW, Tit. v. 10, *&c.*

STIPULATION, in the civil law, the act of stipulating, that is, of treating and concluding terms and conditions to be inserted in a contract. Stipulations were anciently performed at Rome, with abundance of ceremonies; the first whereof was, that one party should interrogate, and the other answer, to give his consent, and oblige himself. By the ancient Roman law, no body could stipulate but for himself; but as the tabelliones were public servants, they were allowed to stipulate for their masters; and the notaries, succeeding the tabelliones, have inherited the same privilege.

STIRIA DUCHY, in Germany, is part of the circle of Austria,

Auſtria, bounded by the duchy of Auſtria on the north, by Hungary on the eaſt, and by Carinthia and Carniola on the ſouth-weſt.

STIRLING, a town of Scotland, capital of the county of Stirling: ſituated on the river Forth, thirty miles north weſt of Edinburgh; defended by a caſtle and other works.

STIRRUP, in the manege, a reſt, or ſupport for the horſeman's foot, ſerving to keep him firm in his ſeat, and to enable him to mount.

STIRRUP *of a ſhip*, a piece of timber put upon a ſhip's keel, when ſome of her keel happens to be beaten off, and they cannot come conveniently to put or fit in a new piece; then they patch in a piece of timber, and bind it on with an iron, which goes under the ſhip's keel, and comes up on each ſide of the ſhip, where it is nailed ſtrongly with ſpikes; and this they call a ſtirrup.

STIVES, the ancient Thebes, in the province of Achaia, now Livadia, in European Turkey.

STOCKHERN, a town of Germany, in the circle of Weſtphalia, and biſhopric of Liege: ſituated on the river Maes, twelve miles north of Maeſtricht.

STOCK, in gardening, *&c.* the ſtem or trunk of a tree.

STOCKBRIDGE, a borough-town of Hampſhire, ſituated ſeven miles north-weſt of Wincheſter. It ſends two members to parliament.

STOCK-BROKER. See BROKER, and the next article.

STOCK-JOBBING, the art or myſtery of trafficking in the public ſtocks or funds. See STOCKS.

STOCKHOLM, the capital city of Sweden, ſituated on ſeveral ſmall iſlands in the Meller Lake: E. long. 18°, N. lat. 59° 30′, three hundred miles north-eaſt of Copenhagen, nine hundred north-eaſt of London, and four hundred weſt of Peterſburgh. It is neither walled nor fortified, being ſufficiently ſecured by nature, with little rocks and iſlands, which ſurround it, though it has a ſpacious harbour ſufficient for the largeſt fleets. That part of the town which is properly the city, ſtands upon a little iſland that is not more than a mile and a half in circumference, but the ſuburbs on the adjacent iſland are much larger. The inhabitants are computed about thirty thouſand.

STOCKING, that part of the cloathing of the leg and foot which ſcreens them from the cold, *&c.* Anciently, the only ſtockings in uſe were made of cloth, or of milled ſtuffs ſewed together; but ſince the invention of knitting and weaving ſtockings of ſilk, wool, cotton, thread, *&c.* the uſe of cloth ſtockings is quite out of doors.

STOCKPORT, a market-town of Cheſhire, ſituated thirty-four miles north-eaſt of Cheſter.

STOCKTON, a port-town of Durham, ſituated near the mouth of the river Tees, ſixteen miles ſouth of Durham.

STOCKZOW, a town of Bohemia, in the duchy of Sileſia, ſituated on the river Viſtula, thirty-ſeven miles ſouth-eaſt of Troppaw.

STOCKS *or* PUBLIC FUNDS *in England.* As there are few ſubjects of converſation more general than the value of ſtocks, and hardly any thing ſo little underſtood, we ſhall here give account of them in as clear and conciſe a manner as poſſible; preſenting our readers with the rationale of the ſtocks, and a ſhort hiſtory of the ſeveral companies*, deſcribing the nature of their ſeparate funds, the uſes to which they are applied, and the various purpoſes they anſwer, both with reſpect to the government, the companies themſelves, and the community in general.

In order to have a clear idea of the money-tranſactions of the ſeveral companies, it is neceſſary to know ſomething of money in general, and the difference between that and the current ſpecie. See the article MONEY.

Money is the ſtandard of the value of all the neceſſaries and accommodations of life; and paper money is the repreſentative of that ſtandard to ſuch a degree, as to ſupply its place, and to anſwer all the purpoſes of gold and ſilver coin. Nothing is neceſſary to make this repreſentative of money ſupply the place of ſpecie, but the credit of that office or company who delivers it: which credit conſiſts in its always being ready to turn it into ſpecie whenever required. This is exactly the caſe of the Bank of England: the notes of this company are of the ſame value as the current coin, as they may be turned into it whenever the poſſeſſor pleaſes. From hence, as notes are a kind of money, the counterfeiting them is puniſhed with death as well as coining.

The method of depoſiting money in the bank, and exchanging it for notes (though they bear no intereſt) is attended with many conveniencies; as they are not only ſafer than money in the hands of the owner himſelf, but as the notes are more portable and capable of a much more eaſy conveyance; ſince a bank note for a very large ſum may be ſent by the poſt, and, to prevent the deſigns of robbers, may, without damage, be cut in two, and ſent at two ſeveral times. Or bills, called bank poſt-bills, may be had by application at the bank, which are particularly calculated to prevent loſſes by robberies, they being made payable to the order of the perſon who takes them out at a certain number of days after ſight; which gives an opportunity to ſtop bills at the bank if they ſhould be loſt, and prevents their being ſo eaſily negotiated by ſtrangers as common bank notes are: and whoever conſiders the hazard, the expence and trouble there would be in ſending large ſums of gold and ſilver to and from diſtant places, muſt alſo conſider this as a very ſingular advantage. Beſide which, another benefit attends them; for if they are deſtroyed by time, or other accidents, the bank will, on oath being made of ſuch accident, and ſecurity being given, pay the money to the perſon who was in poſſeſſion of them.

Bank notes differ from all kinds of ſtock in theſe three particulars. 1. They are always of the ſame value. 2. They are paid off without being transferred; and, 3. They bear no intereſt: while ſtocks are a ſhare in a company's funds, bought without any condition of having the principal returned. India bonds indeed (by ſome perſons, tho' erroneouſly, denominated ſtock) are to be excepted; they being made payable at ſix months notice, either on the ſide of the company or of the poſſeſſor.

By the word *ſtock* was originally meant a particular ſum of money contributed to the eſtabliſhing a fund to enable a company to carry on a certain trade, by means of which the perſon became a partner in that trade, and received a ſhare of the profit made thereby, in proportion to the money employed.

* Of theſe a general account only was given under the words COMPANY, and BANK, as it would be neceſſary to reſume them in connection with the preſent article, the better to illuſtrate it.

ployed. But this term has been extended farther, though improperly, to signify any sum of money which has been lent to the government, on condition of receiving a certain interest till the money is repaid, and which makes a part of the national debt. As the security both of the government and of the public companies is esteemed preferable to that of any private person, as the stocks are negotiable and may be sold at any time, and as the interest is always punctually paid when due; so they are thereby enabled to borrow money on a lower interest than what could be obtained from lending it to private persons, where there must be always some danger of losing both principal and interest.

But as every capital stock or fund of a company is raised for a particular purpose, and limited by parliament to a certain sum, it necessarily follows, that when that fund is compleated, no stock can be bought of the company; though shares already purchased may be transferred from one person to another. This being the case, there is frequently a great disproportion between the original value of the shares, and what is given for them when transferred: for if there are more buyers than sellers, a person who is indifferent about selling will not part with his share without a considerable profit to himself; and, on the contrary, if many are disposed to sell, and few inclined to buy, the value of such shares will naturally fall, in proportion to the impatience of those who want to turn their stock into specie.

These observations may serve to give our readers some idea of the nature of that unjustifiable and dishonest practice called *stock jobbing*, the mystery of which consists in nothing more than this: The persons concerned in that practice, who are denominated stock-jobbers, make contracts to buy or sell, at a certain distant time, a certain quantity of some particular stock, against which time they endeavour, according as their contract is, either to raise or lower such stock, by raising rumours and spreading fictitious stories in order to induce people either to sell out in a hurry, and consequently cheap, if they are to deliver stock, or to become unwilling to sell, and consequently to make it dearer, if they are to receive stock.

The persons who make these contracts are not in general possessed of any real stock; and when the time comes that they are to receive or deliver the quantity they have contracted for, they only pay such a sum of money as makes the difference between the price the stock was at when they made the contract, and the price it happens to be at when the contract is fulfilled; and it is no uncommon thing for persons not worth 100 l. to make contracts for the buying or selling 100,000 l. stock. In the language of Exchange Alley, the buyer in this case is called the Bull, and the seller the Bear.

Beside these, there are another set of men, who, though of a higher rank, may properly enough come under the same denomination. These are your great monied men, who are dealers in stock and contracters with the government whenever any new money is to be borrowed. These indeed are not fictitious, but real buyers and sellers of stock; but by raising false hopes, or creating groundless fears, by pretending to buy or sell large quantities of stock on a sudden, by using the fore-mentioned set of men as their instruments, and other like practices, are enabled to raise or lower the stocks one or two per cent. at pleasure.

However, the real value of one stock above another, on account of its being more profitable to the proprietors, or any thing that will really, or only in imagination, affect the credit of a company, or endanger the government, by which that credit is secured, must naturally have a considerable effect on the stocks. Thus, with respect to the interest of the proprietors, a share in the stock of a trading company which produces 5 l. or 6 l. per cent. per ann. must be more valuable than an annuity with government security, that produces no more than 3 l. or 4 l. per cent. per annum; and consequently such stock must sell at a higher price than such an annuity. Though it must be observed, that a share in the stock of a trading company producing 5 l. or 6 l. per cent. per annum, will not fetch so much money at market as a government annuity producing the same sum; because the security of the company is not reckoned equal to that of the government, and the continuance of their paying so much per annum is more precarious, as their dividend is, or ought to be, always in proportion to the profits of their trade.

As the stocks of the East India, the bank, and South-Sea companies, are distinguished by different denominations, and are of a very different nature, we shall give a short history of each of them, together with an account of the different stocks each is possessed of; beginning with the East India company, as the first established.

Of the East India Company.

There is no trading company in Europe, the Dutch East India company excepted, which can be put in competition with this. Its was first established in the latter end of the reign of queen Elizabeth; and its privileges have been enlarged, or confirmed, by almost every monarch since. Its shares, or subscriptions, were originally only 50 l. sterling; and its capital only 369,891 l. 5 s. but the directors having a considerable dividend to make in 1676, it was agreed to join the profits to the capital, by which the shares were doubled, and consequently each became of 100 l. value, and the capital 739,782 l. 10 s.; to which capital, if 963,639 l. the profits of the company to the year 1685, be added, the whole stock will be found to be 1,703,402 l.

However, this company having sustained several losses by the Dutch, and the subjects of the great Mogul, was in a declining way at the Revolution, when the war with France reduced it so low, that it appearing scarcely possibly to be supported, a new one was erected. The merchants forming the new East India company received their charter in 1698, having, in consideration of the grant thereof, lent the government two millions at 8 per cent. per annum; and pushing their trade with vigour, they soon carried on twice the business that was ever done by the old company. But after the two companies had subsisted a few years in a separate state, means were contrived to unite them; which was effected in 1702, when a new charter was granted them under the title of the United Company of Merchants trading to the East Indies.

To the two millions advanced by the new company, the united company in the 6th of queen Anne lent the government 1,200,000 l. which made their whole loan amount to 3,200,000 l. A further sum was also lent by the company in 1730, on a renewal of their charter, the interest of which is reduced to 3 per cent. and called the India 3 per cent. annuities.

As to India stock, it is of a quite different nature; for as that is not money put out to interest, but the trading stock

ſtock of the company; and the proprietors of the ſhares, inſtead of receiving a regular annuity, have a dividend of the profits ariſing from the company's trade; which, as it is more valuable, theſe ſhares generally ſell at a price much above the original value.

As to the management of this united company, all perſons without exception, natives and foreigners, men and women, are admitted members of it, and 500 l. in the ſtock of the company gives the owner a vote in the general court, and 2000 l. qualifies him to be choſen a director. The directors are 24 in number, including the chairman, and deputy chairman, who may be re-elected for four years ſucceſſively. The chairman has a ſalary of 200 l. a year, and each of the directors 150 l. The meetings or courts of directors are to be held at leaſt once a-week; but are commonly oftener, being ſummoned as occaſion requires.

Out of the body of directors are choſen ſeveral committees, who have the peculiar inſpection of certain branches of the company's buſineſs; as the committee of correſpondence, a committee of buying, a committee of treaſury, a houſe committee, a committee of warehouſes, a commitee of ſhipping, a committee of accompts, a committee of law-ſuits, and a committee to prevent the growth of private trade, *&c.* who have under them a ſecretary, caſhier, clerks, warehouſe-keepers, *&c.*

Other officers of the company are governors and factors abroad; ſome of whom have guards of ſoldiers, and live in all the ſtate of ſovereign princes.

Of the Bank of England.

The company of the bank was incorporated by parliament, in the 5th and 6th years of king William and queen Mary, by the name of the Governor and Company of the Bank of England, in conſideration of the loan of 1,200,000 l. granted to the government, for which the ſubſcribers received almoſt 8 per cent. By this charter, the company are not to borrow under their common ſeal, unleſs by act of parliament; they are not to trade, or ſuffer any perſon in truſt for them to trade in any goods or merchandize; but they may deal in bills of exchange, in buying or ſelling bullion, and foreign gold and ſilver coin, *&c.*

By an act of parliament paſſed in the 8th and 9th year of king William III. they were impowered to enlarge their capital ſtock to 2,201,171 l. 10 s. It was then alſo enacted, that bank-ſtock ſhould be a perſonal, and not a real eſtate; that no contract either in word or writing, for buying or ſelling bank-ſtock, ſhould be good in law, unleſs regiſtered in the books of the bank within ſeven days, and the ſtock transferred in 14 days; and that it ſhould be felony, without benefit of clergy, to counterfeit the common ſeal of the bank, or any ſealed bank-bill, or any bank-note, or to alter or eraſe ſuch bills or notes.

By another act paſſed in the 7th of queen Anne, the company were impowered to augment their capital to 4,402,343 l. and they then advanced 400.000 l. more to the government, and in 1714 they advanced another loan of 1,500.000 l.

In the third year of the reign of king George I. the intereſt of their capital ſtock was reduced to 5 per cent. when the bank agreed to deliver up as many exchequer-bills as amounted to 2,000,000 l. and to accept an annuity of 100,000 l. and it was declared lawful for the bank to call from their members, in proportion to their intereſts in the capital ſtock, ſuch ſums of money as in a general court ſhould be found neceſſary. If any member ſhould neglect to pay his ſhare of the moneys ſo called for, at the time appointed by notice in the London Gazette, and fixed upon the Royal Exchange, it ſhould be lawful for the bank not only to ſtop the dividend of ſuch member, and to apply it toward payment of the money in queſtion; but alſo to ſtop the transfers of the ſhare of ſuch defaulter, and to charge him with an intereſt of 5 l. per cent. per annum for the money ſo omitted to be paid: and if the principal and intereſt ſhould be three months unpaid, the bank ſhould then have power to ſell ſo much of the ſtock belonging to the defaulter as would ſatisfy the ſame.

After this the bank reduced the intereſt of the 2,000,000 l. lent to the government from 5 to 4 per cent. and purchaſed ſeveral other annuities, which were afterward redeemed by the government, and the national debt due to the bank reduced to 1,600,000 l. But in 1742, the company engaged to ſupply the government with 1,600,000 l. at 3 per cent. which is now called the 3 per cent. annuities, ſo that the government was now indebted to the company 3,200,000 l. the one half carrying 4, and the other 3 per cent.

In the year 1746, the company agreed that the ſum of 986,800 l. due to them in the exchequer-bills unſatisfied, on the duties for licences to ſell ſpirituous liquors by retail, ſhould be cancelled, and in lieu thereof to accept of an annuity of 39,442 l. the intereſt of that ſum at 4 per cent. The company alſo agreed to advance the further ſum of 1,000,000 l. into the exchequer, upon the credit of the duties ariſing by the malt and land tax, at 4 per cent. for exchequer-bills to be iſſued for that purpoſe; in conſiderution of which, the company were enabled to augment their capital with 986,800 l. the intereſt of which, as well as that of the other annuities, was reduced to 3 l. 10 s. per cent. till the 25th of December 1757, and from that time to carry only 3 per cent.

And in order to enable them to circulate the ſaid exchequer bills, they eſtabliſhed what is now called bank circulation: the nature of which not being well underſtood, we ſhall take the liberty to be a little more particular in its explanation than we have been with regard to the other ſtocks.

The company of the bank are obliged to keep caſh ſufficient to anſwer not only the common, but alſo any extraordinary demand that may be made upon them; and whatever money they have by them, over and above the ſum ſuppoſed neceſſary for theſe purpoſes, they employ in what may be called the trade of the company; that is to ſay, in diſcounting bills of exchange, in buying of gold and ſilver, and in government ſecurities, *&c.* But when the bank entered into the above mentioned contract, as they did not keep unemployed a larger ſum of money than what they deemed neceſſary to anſwer their ordinary and extraordinary demands, they could not conveniently take out of their current caſh ſo large a ſum as a million, with which they were obliged to furniſh the government, without either leſſening that ſum they employed in diſcounting, buying gold and ſilver, *&c.* (which would have been very diſadvantageous to them,) or inventing ſome method that ſhould anſwer all the purpoſes of keeping the million in caſh. The method which

which they choſe, and which fully anſwers their end, was as follows.

They opened a ſubſcription, which they renew annually, for a million of money; wherein the ſubſcribers advance 10 per cent. and enter into a contract to pay the remainder, or any part thereof, whenever the bank ſhall call upon them, under the penalty of forfeiting the 10 per cent. ſo advanced; in conſideration of which, the bank pays the ſubſcribers 4 per cent. intereſt for the money paid in, and $\frac{1}{4}$ per cent. for the whole ſum they agree to furniſh; and in caſe a call ſhould be made upon them for the whole, or any part thereof the bank farther agrees to pay them at the rate of 5 per cent. per annum for ſuch ſum till they repay it, which they are under an obligation to do at the end of the year. By this means the bank obtains all the purpoſes of keeping a million of money by them; and though the ſubſcribers, if no call is made upon them (which is in general the caſe,) receive $6\frac{1}{2}$ per cent. for the money they advance, yet the company gains the ſum of 23,500 l. per annum by the contract; as will appear by the following account.

The bank receives from the government for the advance of a million ——	£ 30,000
The bank pays to the ſubſcribers who advance 100,000 l. and engage to pay (when called for) 900,000 l. more — —	6,500
The clear gain to the bank therefore is	23,500

This is the ſtate of the caſe, provided the company ſhould make no call on the ſubſcribers: which they will be very unwilling to do, becauſe it would not only leſſen their profit, but affect the public credit in general.

Bank-ſtock may not improperly be called a trading ſtock, ſince with this they deal very largely in foreign gold and ſilver, in diſcounting bills of exchange, &c. Beſide which, they are allowed by the government very conſiderable ſums annually for the management of the annuities paid at their office. All which advantages render a ſhare in their ſtock very valuable, though it is not equal in value to the Eaſt India ſtock. The company make dividends of the profits half-yearly, of which notice is publicly given; when thoſe who have occaſion for their money may readily receive it; but private perſons, if they judge convenient, are permitted to continue their funds, and to have their intereſt added to the principal.

This company is under the direction of a governor, deputy-governor, and 24 directors, who are annually elected by the general court, in the ſame manner as in the Eaſt India company. Thirteen, or more, compoſe a court of directors for managing the affairs of the company.

The officers of this company are very numerous.

Of the South-Sea Company.

During the long war with France in the reign of queen Anne, the payment of the ſailors of the royal navy being neglected, and they receiving tickets inſtead of money, were frequently obliged by their neceſſities to ſell theſe tickets to avaritious men at a diſcount of 40 l. and ſometimes 50 l. per cent. By this and other means the debts of the nation unprovided for by parliament, and which amounted to 9,471,321 l. fell into the hands of theſe uſurers. On which, Mr Harley, at that time chancellor of the exchequer, and afterward earl of Oxford, propoſed a ſcheme to allow the proprietors of theſe debts and deficiencies 6 l. per cent. per annum, and to incorporate them in order to their carrying on a trade to the South-Sea; and they were accordingly incorporated under the title of the Governor and Company of Merchants of Great Britain trading to the South-Seas and other parts of America, and for encouraging the Fiſhery, &c.

Though this company ſeemed formed for the ſake of commerce, it is certain the miniſtry never thought ſeriouſly, during the courſe of the war, about making any ſettlements on the coaſt of South America, which was what flattered the expectations of the people; nor was it indeed ever carried into execution, or any trade ever undertaken by this company, except the Aſſiento, in purſuance of the treaty of Utrecht, for furniſhing the Spaniards with negroes, of which this company was deprived by the late convention between the courts of Great Britain and Spain, ſoon after the treaty of Aix la Chapelle in 1748.

After this, ſome other ſums were lent to the government in the reign of queen Anne at 6 per cent. In the third of George I. the intereſt of the whole was reduced to 5 per cent. and they advanced two millions more to the government at the ſame intereſt. By the ſtatute of the 6th of George I. it was declared that this company might redeem all or any of the reedeemable national debts, in conſideration of which the company were empowered to augment their capital according to the ſums they ſhould diſcharge: and for enabling the company to raiſe ſuch ſums for purchaſing annuities, exchanging for ready money new exchequer bills, carrying on their trade, &c. the company might, by ſuch means as they ſhould think proper, raiſe ſuch ſums of money as in a general court of the company ſhould be judged neceſſary. The company were alſo impowered to raiſe money on contracts, bills, bonds, or obligations under their common ſeal, on the credit of their capital ſtock. But if the ſub-governor, deputy-governor, or other members of the company, ſhould purchaſe lands or revennes of the crown upon account of the corporation, or lend money by loan or anticipation on any branch of the revenne, other than ſuch part only on which a credit of loan was granted by parliament, ſuch ſub-governor, or other member of the company, ſhould forfeit treble the value of the money ſo lent.

The fatal South-Sea ſcheme, tranſacted in the year 1720, was executed upon the laſt mentioned ſtatute. The company had at firſt ſet out with good ſucceſs, and the value of their ſtock for the firſt five years had riſen faſter than that of any other company; and his Majeſty, after purchaſing 10,000 l. ſtock, had condeſcended to be their governor. Things were in this ſituation, when, taking advantage of the above ſtatute, the South Sea bubble was projected. The pretended deſign of which was to raiſe a fund for carrying on a trade to the South Seas, and purchaſing annuities, &c. paid to the other companies: and propoſals were printed and diſtributed, ſhewing the advantages of the deſign, and inviting perſons into it. The ſum neceſſary for carrying it on, together with the profits that were to ariſe from it, were divided into a certain number of ſhares, or ſubſcriptions, to be purchaſed by perſons diſpoſed to adventure therein. And the better to carry on the deception, the directors engaged to make very large dividends, and actually declared, that every 100 l. original ſtock would yield 50 l. per annum; which occaſioned ſo great a riſe of their ſtock, that a ſhare of 100 l. was ſold for upward of 1000 l. This was

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in the month of July; but before the end of September it fell to 150 l. by which multitudes were ruined, and such a scene of distress occasioned as is scarcely to be conceived. But the consequences of this infamous scheme are too well known. We shall pass over all the other transactions of this company in the reign of king George I. as not material to our present purpose.

By a statue of the 6th of his late Majesty, it was enacted, that from and after the 24th of June 1733, the capital stock of this company, which amounted to 14,651,103 l. 8 s. 1 d. and the shares of the respective proprietors, should be divided into four equal parts; three-fourths of which should be converted into a joint stock, attended with annuities, after the rate of 4 per cent. until redemption by parliament, and should be called The new South Sea annuities; and the other fourth part should remain in the company as a trading capital stock, attended with the residue of the annuities or funds payable at the exchequer to the company for their whole capital, till redemption; and attended with the same sums allowed for charges of management, and with all effects, profits of trade, debts, privileges and advantages belonging to the South Sea company. That the accomptant of the company should twice every year, at Christmas and midsummer, or within one month after, state an account of the company's affairs, which should be laid before the next general court, in order to their declaring a dividend; and all dividends should be made out of the clear profits, and should not exceed what the company might reasonably divide without incurring any farther debt; provided that the company should not at any time divide more than 4 per cent. per annum, until their debts were discharged; and that the South Sea company, and their trading stock, should, exclusively from the new joint annuities, be liable to all the debts and incumbrances of the company; and that the company should cause to be kept within the city of London, an office and books, in which all transfers of the new annuities should be entered and signed by the party making such transfer, or his attorney; and the person to whom such transfer should be made, or his attorney, should underwrite his acceptance, and no other method of transferring the annuities should be good in law

The annuities of this company, as well as the other, are now reduced to 3 l. per cent.

This company is under the direction of a governor, sub-governor, deputy governor, and 21 directors; but no person is qualified to be governor, his Majesty excepted, unless such governor has, in his own name and right, 5000 l. in the trading stock; the sub governor is to have 4000 l. the deputy 3000 l. and a director 2000 l. in the same stock. In every general court, every member having in his own name and right 500 l. in trading stock, has one vote; if 2000 l. two votes; if 3000 l. three votes; and if 5000 l. four votes.

The East India Company, the Bank of England, and the South Sea Company, are the only incorporated bodies to which the government is indebted, except the Million Bank, whose capital is only one million, constituted to purchase the reversion of the long exchequer-orders.

The interest of all the debts owing by the government is now reduced 3 per cent. excepting only the annuities for the years 1756 and 1758, the life-annuities, and the exchequer-orders: but the South Sea company still continues to divide four per cent. on their present capital stock, which they are enabled to do from the profits they make on the sums allowed to them for management of the annuities paid at their office, and from the interest of annuities which are not claimed by the proprietors.

As the prices of the different stocks are continually fluctuating above and below par; so when a person who is not acquainted with transactions of that nature, reads in the papers the prices of stocks, where bank-stock is marked perhaps 127 l. India ditto 134 a 134¼. South Sea ditto 97½, &c. he is to understand that a 100 l. of those respective stocks sell at such a time for those several sums.

In comparing the prices of the different stocks one with another, it must be remembered, that the interest due on them from the time of the last payment, is taken into the current price; and the seller never receives any separate consideration for it, except in the case of India bonds, where the interest due is calculated to the day of the sale, and paid by the purchaser over and above the premium agreed for. But as the interest on the different stocks is paid at different times, this, if not rightly understood, would lead a person not well acquainted with them into considerable mistakes in his computation of their value; some always having a quarter's interest due on them more than others, which makes an appearance of a considerable difference in the price, when in reality there is none at all. Thus, for instance, old South Sea annuities sell at present for £. 85½ or £ 85. 10 s. while new South Sea annuities fetch only £ 84¾, or £ 84 15 s. though each of them produce the same annual sum of £ 3 per cent. but the old annuities have a quarter's interest more due on them than the new annuities, which amounts to 15 s. the exact difference. There is, however, one or two causes that will always make one species of annuities sell somewhat lower than another, though of the same real value; one of which is, the annuities making but a small capital, and there not being for that reason so many people at all times ready to buy into it as into others where the quantity is larger; because it is apprehended, that whenever the government pays off the national debt, they will begin with that particular species of annuity the capital of which is the smallest.

A stock may likewise be affected by the court of chancery; for if that court should order the money which is under their direction to be laid out in any particular stock, that stock, by having more purchasers, will be raised to a higher price than any other of the like value.

By what has been said, the reader will perceive how much the credit and interest of the nation depends on the support of the public funds. While the annuities, and interest for money advanced, is there regularly paid, and the principal insured by both prince and people (a security not to be had in other nations) foreigners will lend us their property, and all Europe be interested in our welfare; the paper of the companies will be converted into money and merchandize, and Great Britain can never want cash to carry her schemes into execution

In other nations, credit is founded on the word of the the prince, if a monarchy; or that of the people, if a republic: but here, it is established on the interests of both prince and people; which is the strongest security: for however lovely and engaging honesty may be in other respects, interest in money-matters will always obtain confidence; because many people pay great regard to their interest, who have but little veneration for virtue.

Stocks, among ſhip-carpenters, a frame of timber, and great poſts, made aſhore, to build pinnaces, ketches, boats, and ſuch ſmall craft, and ſometimes ſmall frigates. Hence we ſay, a ſhip is on the ſtocks, when ſhe is a-building.

Stocks, a wooden machine to put the legs of offenders in, for the ſecuring of diſorderly perſons, and by way of puniſhment in divers caſes, ordained by ſtatute, *&c.*

STOEBE, in botany, a genus of the ſyngeneſia polygamia ſegregata claſs. The receptacle is paleaceous; the pappus is feathered; and every floſcule has a five-leaved calix. There is but one ſpecies, a native of Æthiopia.

STOICS, a ſect of ancient philoſophers, the followers of Zeno, thus called from the Greek στοα, which ſignifies a porch or portico, in regard Zeno uſed to teach under a portico or piazza.

To the praiſe of the Stoics in general, it muſt be confeſſed, that, leſs intent than other philoſophers upon frivolous and often dangerous ſpeculations, they devoted their ſtudies to the clearing up of thoſe great principles of morality which were the firmeſt ſupports of ſociety; but the dryneſs and ſtiffneſs that prevailed in their writings, as well as in their manners, diſguſted moſt of their readers, and abundantly leſſened their utility. Zeno's chief followers, among the Greeks, were Lucippus, Cleanthes, Chryſippus, Diogenes Babylonius, Antipater, Panætius, Poſſidonius, and Epictetus; among the Romans, Cato, Varro, Cicero, Seneca, the emperor Antoninus, *&c.* The Stoics cultivated logic, phyſics, metaphyſics, *&c.* but eſpecially ethics. The prnciples of their dogmata, of the former kinds, are, that there are certain catalepſias or comprehenſions, called innate ideas or principles, naturally found in the mind; that God is the ſeminal cauſe of the univerſe; and, with the Platoniſts, that the world is an animal, by reaſon of God's inhabiting and informing every part thereof; that nature is an artificial fire tending to generation; and that the world is at laſt to be deſtroyed by a conflagration. As for the morality of the Stoics, it was couched much in paradoxes; as, that a wiſe man is void of all paſſions, or perturbation of mind; that pain is no real evil, but that a wiſe man is happy in the midſt of torture, is always the ſame, and is always joyful; that there is none elſe free; that none elſe ought to be eſteemed king, magiſtrate, poet, or philoſopher; that all wiſe men are great men; that they are the only friends or lovers; that nothing can happen to them beyond their expectations; that all virtues are inſenſibly connected together; that all good things are equal, and equally to be deſired; that goodneſs admits of no increaſe or diminution. They own but one God, whom they however call by various names, as Fate, Jupiter, *&c.* by which they did not mean various things, but various powers and relations of the ſame thing. Providence they expreſſed under the name Fate, which Chryſippus defines to be a natural ſeries or compoſition of things mutually following each other, by an immutable nexus or tie, fixed from all eternity. They held the immortality of the ſoul.

STOKEGOMER, a market-town of Somerſetſhire, ſituated twenty-two miles weſt of Wells.

STOKESLY, a market-town of Yorkſhire, ſituated thirty miles north of York.

STOLBERG, a town of Germany, in the circle of Upper Saxony, and territory of Thuringia, fifty-eight miles north-weſt of Leipſic.

STOLE, a ſacerdotal ornament wore by the Romiſh pariſh-prieſts over their ſurplice, as a mark of ſuperiority in their reſpective churches; and by other prieſts, over the alb, at celebrating of maſs, in which caſe it goes a-croſs the ſtomach; and by deacons, over the left ſhoulder, ſcarf-wiſe; when the prieſt reads the goſpel for any one, he lays the bottom of his ſtole on his head. The ſtole is a broad ſwath, or ſlip of ſtuff, hanging from the neck to the feet, with three croſſes thereon.

Groom of the Stole, the eldeſt gentleman of his Majeſty's bed chamber, whoſe office and honour it is to preſent and put on his majeſty's firſt garment, or ſhirt, every morning, and to order the things in the chamber.

Order of the Stole, an order of knights inſtituted by the kings of Arragon. Another military order, at Venice, is called the order of the golden ſtole; thus called from a golden ſtole, which thoſe knights wore over their ſhoulder, reaching to the knee, both before and behind, a palm and a half broad. None are raiſed to this order but patricians, or noble Venetians.

STOMACH, in anatomy. See Anatomy, p. 258.

STOMACHIC, in pharmacy, medicines that ſtrengthen the ſtomach, and promote digeſtion, *&c.*

Stomachic corroboratives are ſuch as ſtrengthen the tone of the ſtomach and inteſtines; among which are carminatives, as the roots of galangals, red gentian, zedoary, pimpinella, calamus, aromaticus, and arum. Of barks and rinds, thoſe of canella alba, ſaſſafras, citrons, Seville and China oranges, *&c.* Of ſpices, pepper, ginger, cloves, cinnamon, cardamums, and mace.

STONES, in natural hiſtory, are defined to be eſſentially compound foſſils, not inflammable, nor ſoluble in water or oil, nor at all ductile; found in continued ſtrata, or beds, of great extent; formed either of a congeries of ſmall particles, in ſome degree reſembling ſand, and lodged in a ſmoother cementitious matter; or elſe of this cementitious matter, and the gritt or ſand-like particles, running together into one ſmooth maſs; or, finally, of granules cohering by contact, without any cementitious matter among them; or compoſed of cryſtal or ſpar, uſually debaſed by earth, and often mixed with talc and other extraneous particles.

Of this claſs of foſſils there are three orders; and under theſe, eight genera.

The firſt order comprehends all the coarſe, harſh, and rough ſtones, of a lax texture, and compoſed of a viſible gritt, reſembling ſand in form, and uſually immerſed in a cementitious matter, and of little natural brightneſs; ſcarce capable of any poliſh, and naturally mouldering away in form of powder from the tools of the workmen. The genera of this order are two, *viz.* the ammochiſta and pſaduria; the former of which conſtitute our grey and rough ſlates; and the latter comprehends moſt of the ſtones uſed in building, particularly Portland ſtone.

The ſecond order conſiſts of ſtones moderately fine, of a more compact and even texture, ſcarce diſtinguiſhable conſtruction, and affording no ſand-like particles to the view; of ſome natural brightneſs, capable of a tolerable poliſh, and flying off from the tools of the workmen in form of ſmall chips. Under this order are comprehended the ſympexia and ſtegania.

The

The third order consists of stones of a very fine substance and elegant structure, naturally of a great brightness, and capable of an elegant polish; composed of granules of various shapes and sizes, but usually flattish, sometimes more, sometimes less distinct; and, in some species, running together into uniform masses, but never lodged in any cementitious substance. Of this order are the marbles, alabasters, porphyries, and granites.

STONE in the bladder. See MEDICINE, and SURGERY.

STONE also denotes a certain quantity or weight of some commodities.

A stone of beef, at London, is the quantity of eight pounds; in Hertfordshire, twelve pounds; in Scotland, sixteen pounds.

STONE CHATTER, in ornithology. See MOTACILLA.

STONEHENGE, in antiquity, a famed pile or monument of huge stones on Salisbury plain, six miles distant from that city.

It consists of the remains of four ranks of rough stones, ranged one within another, some of them, especially in the outermost and third rank, twenty feet high, and seven broad; sustaining others laid across their heads, and fastened by mortises; so that the whole must have anciently hung together.

Antiquaries are now pretty well agreed that it was a British temple; and Dr Langwith thinks it might easily be made probable, at least, that it was dedicated to the sun and moon. Inigo Jones has given a fine scheme of the work, and strives hard to persuade the world, that it was Roman: but Dr Langwith, who took his measures on the spot, assures us he could by no means reconcile them with that scheme.

STONEY-STRATFORD, a market-town of Buckinghamshire, fourteen miles north of Ailesbury.

STOOL, in medicine, an evacuation or discharge of the fæces, *&c.* by the anus.

STOPPER, in a ship, a piece of cable-laid rope, having a wale-knot at one end, with a laniard fastened to it; and the other end is spliced round a thimble in the ring-bolts upon deck, and at the bits: its use is to stop the cable, that it may not run out too fast; in order to which, they make turns with the laniard about the cable, and the wale-knot stops it, so that it cannot slip away faster than is necessary.

STORAX, or STYRAX, in natural history, a dry and solid resin, of a reddish colour, and a peculiarly fragrant smell; of which there are two kinds, the styrax calamita, or styrax in tears, and the styrax vulgaris; whereof the former is by far the purer and finer kind, imported in small loose granules, or else in large masses composed of such granules: it anciently used to be packed up in reeds, for the more secure carriage; whence the name. The common storax is likewise a fine and pure resin, though less so than the former; and is brought to us in large lumps, not formed of granules, but of one uniform consistence.

These are the two genuine kinds of storax; but neither of them is that met with in our shops, which is a kind of saw-dust connected into lumps, by just so much of the storax resin as will make the other matters hang together. This is what our apothecaries use, under the name of storax; but it is adviseable to strain carefully the pure resin from the filth, and use no part of the latter.

The two genuine kinds of storax, which ought always to be used where they can be had, differ only in this; that the granulated storax flows naturally from the styrax tree, and the common kind is obtained from the same tree by incision.

Storax is brought to us from Syria, and the East-Indies; and ought to be chosen pure, very fragrant, and of an acid taste. It is much recommended as a detergent and balsamic, in disorders of the breast: it is also esteemed a cordial, and is recommended in vertigoes and other disorders of the head and nerves.

Liquid STORAX, in pharmacy, is a drug very different from the resin above described; being a resinous juice, of the consistence of venice-turpentine, or thicker: it is, when clean, pellucid, of a brownish colour, with a cast sometimes of reddish, and sometimes of greyish in it. Its smell is somewhat like that of common storax, only much stronger, and even disagreeable: its taste is acrid, aromatic, and somewhat bitterish; and it is oily, or unctuous. It should be chosen thin, pellucid, of a clean brown colour, and of a very strong smell.

STORGE, a greek term, frequently used for the parental instinct, or natural affection, which almost all animals bear their young; whereby they are most powerfully moved to defend them from dangers, and procure for them suitable nourishment.

STORK, in ornithology. See ARDEA.

STORM BIRD. See PROCELLARIA.

STORMAR, the south division of Holstein, whereof Hamburgh is the chief town.

STORTFORD, a market-town of Hertfordshire, thirty miles north of London.

STOVES, in gardening, are buildings erected for the preservation of tender exotic plants, which, without that assistance, will not bear the cold of our winter, because they require an artificial warmth.

Stoves are of two kinds, distinguished by the names of the dry and the bark-stoves.

The dry stove has the flues, in which the smoke is carried, either laid under the pavement of the floor, or erected in the back part of the house over each other, and returned six or eight times all along the stove. In these stoves the plants are placed on scaffolds, and benches of boards, raised above one another; and the plants principally preserved in these are the aloes, ceruses, euphorbiums, tithymals, and other succulent plants, which are impatient of moisture in winter, and therefore are not to be kept among trees, or herbaceous plants, which perspire freely.

The bark-stoves are made with a large pit, nearly of the length of the house, which is three feet deep, and six or seven feet wide. This pit is to be filled with fresh tanner's bark to make a hot-bed, and in this the pots containing the tender plants are to be plunged.

STOURBRIDGE, a market-town, nineteen miles north of Worcester.

STOUTH-RIEF, in Scots law. See LAW, Tit. xxxiii. 30.

STOW, a market-town, twenty miles east of Glocester.

STOWAGE, in the sea-language, the placing goods orderly in the hold of a ship, *viz.* the heaviest next the ballast, *&c.*

STOWEY, a market-town of Somersetshire, eighteen miles west of Wells.

STOW-MARKET, a town of Suffolk, ten miles east of Bury.

STRABISMUS, SQUINTING, a diſtortion of the eyes, whereby their pupils are turned from, inſtead of being directed towards, objects at which they look: ſometimes only one eye, but more frequently both are thus affected. See MEDICINE, p. 155.

STRAIN, in ſurgery, a violent extenſion of the ſinews, or tendons, of ſome muſcle.

STRAIT, is a narrow paſſage out of one ſea into another, as thoſe of Gibraltar and Magellan.

STRAKES, in the ſea-language, ſignify the uniform ranges of planks on the bottom, decks, and ſides of ſhips; and the garboard-ſtrake is that next the keel.

STRALSUND, a ſtrong city and port-town of Germany, in the circle of Upper Saxony and duchy of Pomerania, ſubject to Sweden: E. long. 13° 22′, and N lat. 54° 23′.

STRAND, ſignifies any ſhore of the ſea, or bank of a great river: hence an immunity from paying cuſtoms on goods or veſſels, was anciently expreſſed by ſtrand and ſtream.

STRANDED, among ſeamen, is ſaid of a ſhip that is driven aſhore by a tempeſt, or runs on ground through ill ſteerage, and ſo periſhes.

STRANGFORD, a town of Ireland, that gives name to a loch and bay in the county of Down and province of Ulſter, ſituated nine miles eaſt of Down.

STRANGURY, in medicine a ſuppreſſion of urine. See MEDICINE, p. 160.

STRANRAER, a parliament-town of Scotland, ſituated in the ſhire of Galloway, on a bay of the frith of Clyde.

STRAPS *of a ſaddle*, are ſtrong leather-thongs, nailed to the bows of a ſaddle, in order to make the girths, *&c.* faſt.

STRAPADO, a kind of military puniſhment, wherein the criminal is hoiſted up by a rope, and let down, ſo that, by the weight of his body in the fall, his arms are diſlocated

STRASBURG, a free imperial city of Germany, capital of the landgraviate of Alſace, ſituated near the weſtern bank of the Rhine, in E. long. 7° 35′, and N lat. 48° 38′.

STRATA, in natural hiſtory, the ſeveral beds or layers of different matters, whereof the body of the earth is compoſed.

The ſtrata include all the layers of earths, minerals, metals, ſtones, *&c.* lying under the upper tegument, or ſtratum, the turf or mould.

The time when theſe ſeveral ſtrata were laid, was doubtleſs at the creation; unleſs, with ſome great naturaliſts, as Steno, Dr. Woodward, *&c* we ſuppoſe the globe of the earth to have been diſſolved by the deluge.

STRATAGEM, in the art of war, any device for the deceiving and ſurpriſing an enemy.

STRATEGUS, in Grecian antiquity, an annual officer among the Athenians, whereof there were two choſen, to command the troops of the ſtate.

STRATFORD, a populous market-town of Warwickſhire, ſituated on the river Avon, ſix miles ſouth of Warwick; remarkable for being the birth-place of the inimitable Shakeſpeare, and lately for the Jubilee held there in honour of his memory, September 1769.

STRATHNAVER, a ſubdiviſion or diſtrict of the county of Sutherland, in Scotland, having the Caledonian ocean on the north and weſt.

STRATIFICATION, in chemiſtry, the ranging any thing to be calcined in ſeveral layers or ſtrata one above another.

STRATIOTES, in botany, a genus of the polyandria hexagynia claſs. The ſpatha conſiſts of two leaves, and the perianthium of three ſegments; the corolla has three petals, and the berry has ſix cells. There are two ſpecies, one of them, *viz.* the aloides, water-aloe, or freſh-water ſoldier, a native of Britain.

STRATTON, a market-town of Cornwal, ſituated a little ſouth of the Briſtol channel, fourteen miles north-weſt of Launceſton.

STRAWBERRY, in botany. See FRAGARIA.

STRAWBERRY TREE, in botany See ARBUTUS.

STRENGTH, in phyſiology, the ſame with force or power.

STRENGTHENERS, in pharmacy, medicines that add to the bulk and firmneſs of the ſolids: and ſuch are all abſorbent, agglutinant, and aſtringent medicines.

STRIÆ, in the ancient architecture, the ſame with the flutings of columns. See FLUTES.

STRIATED LEAF, among botaniſts, one that has a number of longitudinal furrows on its ſurface.

STRIGONENSIS TERRA, *earth of Strigonium*, in the materia medica, a red earth, of the bole kind, found about the gold-mines at Strigonium in Hungary, and uſed in ſome places as an aſtringent and ſudorific.

It is but of a coarſe and impure texture, and lighter than moſt of the boles in colour; it is of a ſtrong, but dull red, and is of a tolerably ſmooth ſurface; it is apt to crumble to pieces between the fingers, and ſtains the ſkin in handling; it melts freely in the mouth, and has a remarkable ſmoothneſs, but very little aſtringency in its taſte, and leaves a ſenſible grittineſs between the teeth; it is ſometimes veined and ſpotted with ſmall moleculæ of an earth, like the whitiſh variegations of the red French bole.

STRIKE, a meaſure of capacity, containing four buſhels.

STRIKE, among ſeamen, is a word variouſly uſed: when a ſhip, in a fight, or on meeting with a ſhip of war, lets down or lowers her top-ſails, at leaſt half-maſt high, they ſay ſhe ſtrikes, meaning ſhe yields, or ſubmits, or pays reſpect to the ſhip of war. Alſo, when a ſhip touches ground, in ſhoal-water, they ſay ſhe ſtrikes. And when a top-maſt is to be taken down, the word of command is, Strike the top-maſt, *&c.*

STRIX, in ornithology, a genus belonging to the order of accipitres. The bill is hooked, but has no cere or wax; the noſtrils are covered with ſetaceous feathers; the head is very large, as are alſo the ears and eyes; and the tongue is bifid. There are twelve ſpecies, comprehending all the owl-kind. They are night-birds, and feed upon mice, bats, *&c*

STROBILUS, among botaniſts. See BOTANY, p. 637.

STROMATEUS, in ichthyology, a genus belonging to the order of apodes. The head is compreſſed, the teeth are in the jaws and palate; the body is oval, and ſlimy; and the tail is forked. There are two ſpecies.

STROMBOLI, one of the Lipari iſlands, fifty miles north of Meſſina.

STRONGOLI, a town of the Hither Calabria, in the kingdom of Naples, ſituated on the gulph of Taranto.

STROPHE, in ancient poetry, a certain number of verſes, including a perfect ſenſe, and making the firſt part of an ode.

STROUD, a market-town, nine miles ſouth of Gloceſter.

STRUMÆ,

STRUMÆ, ſcrophulous tumours ariſing on the neck and throat, conſtituting what is commonly called the king's evil. See MEDICINE, p. 137, *&c.*

STRUTHIO, the OSTRICH, in ornithology, a genus belonging to the order of grallæ. The bill is ſomewhat conical; the noſtrils are oval; the wings are ſhort, and not fit for flying; and the feet are of the running kind. There are three ſpecies. The camelus, or common oſtrich, is a native of Syria, Arabia, Lybia, and Africa. This is the largeſt of all birds; it runs ſwifter than any animal; it lays about 50 eggs in the ſand, and ſits upon them only during the night, the heat of the ſun being ſufficient during the day.

STRYCHNOS, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of five ſegments; and the berry has but one cell. There are two ſpecies, both natives of Britain.

STUCCO, in building, a compoſition of white marble, pulverized and mixed with plaiter of lime; and the whole being ſifted and wrought up with water, is to be uſed like common plaſter: this is what Pliny means by marmoratum opus, and albarium opus.

STUFF, in commerce, a general name for all kinds of fabricks of gold, ſilver, ſilk, wool, hair, cotton, or thread, manufactured on the loom; of which number are velvets, brocades, mohairs, ſattins, taffeties, cloths, ſerges, *&c.*

STUM, in the wine-trade, denotes the unfermented juice of the grape, after it has been ſeveral times racked off and ſeparated from its ſediment. The caſks are, for this purpoſe, well matched, or fumigated with brimſtone every time, to prevent the liquor from fermenting, as it would otherwiſe readily do, and become wine.

STUPOR, a numbneſs in any part of the body, whether occaſioned by ligatures obſtructing the blood's motion, by the palſy, or the like.

STUPHA, or STUPE, in medicine, is a piece of cloth dipped in ſome proper liquor, and applied to an affected part, by way of fomentation or epithem.

STURGEON. See ACCIPENSER.

STURMINSTER, a market-town, eighteen miles north of Dorcheſter.

STURNUS, the STARLING, in ornithology, a genus belonging to the order of paſſeres. The beak is ſubulated, depreſſed, and ſomewhat blunt; the ſuperior mandible is entire, and ſomewhat open at the edges; the noſtrils are marginated above; and the tongue is ſharp and emarginated. There are five ſpecies, diſtinguiſhed by their colour.

STYLE, a word of various ſignifications, originally deduced from STYLOS, a kind of bodkin, wherewith the ancients wrote on plates of lead, or on wax, *&c.* and which is ſtill uſed to write on ivory-leaves, and paper prepared for that purpoſe, *&c.*

STYLE, in dialling, denotes the gnomon or cock of a dial, raiſed on the plane thereof, to project a ſhadow. See DIALLING.

STYLE, in botany. See BOTANY, p. 637.

STYLE, in matters of language, a particular manner of expreſſing one's thoughts agreeably to the rules of ſyntax; or, as F. Buffier more accurately defines it, the manner wherein the words, conſtructed according to the laws of ſyntax, are arranged among themſelves, ſuitably to the genius of the language. See COMPOSITION.

STYLE, in juriſprudence, the particular form or manner of proceeding in each court of juriſdiction, agreeable to the rules and orders eſtabliſhed therein: thus we ſay the ſtyle of the court of Rome, of Chancery, of Parliament, of the Privy council, *&c.*

Old-STYLE, the Julian manner of computing time, as the *New*-STYLE is the Gregorian method of computation. See ASTRONOMY, p. 490.

STYLET, a ſmall dangerous kind of poinard, which may be concealed in the hand, chiefly uſed in treacherous aſſaſſinations. The blade is uſually triangular, and ſo ſlender that the wound it makes is almoſt imperceptible.

STYLITES, an appellation given to a kind of ſolitaries, who ſpend their lives ſeated on the tops of columns, to be, as they imagine, the better diſpoſed for meditation, *&c.* Of theſe we find ſeveral mentioned in ancient writers, and even as low as the eleventh century. The founder of the order was St. Simon Stylites, a famous anchoret in the fifth century, who took up his abode on a column ſix cubits high; then on a ſecond, of twelve cubits; a third, of twenty-two; and, at laſt, on another of thirty-ſix. The extremity of theſe columns were only three feet in diameter, with a kind of rail or ledge about it that reached almoſt to the girdle, ſomewhat reſembling a pulpit. There was no lying down in it. The faquirs, or devout people of the eaſt, imitate this extraordinary kind of life even to this day.

STYLOGLOSSUS, in anatomy. See ANATOMY, p. 304.

STYLOHYOIDÆUS, in anatomy. See ANATOMY, p. 304.

STYLOIDES, in anatomy. See ANATOMY, p. 155.

STYLOPHARYNGÆUS, in anatomy. See ANATOMY, p. 304.

STYPTIC, in pharmacy, medicines which by their aſtringent qualities ſtop hæmorrhages.

STYRAX, in botany, a genus of the dodecandria monogynia claſs. The calix conſiſts of five teeth, and the corolla of one funnel-ſhaped petal; and the drupa has one cell, containing two ſeeds. There is but one ſpecies, a native of Syria. See STORAX.

SUBALTERN, a ſubordinate officer, or one who diſcharges his poſt under the command, and ſubject to the direction of another: ſuch are lieutenants, ſub-lieutenants, cornets and enſigns, who ſerve under the captain.

SUBBUTEO, in ornithology. See FALCO.

SUBCLAVIAN, in anatomy, is applied to any thing under the arm-pit or ſhoulder, whether artery, nerve, vein, or muſcle.

SUBCOSTAL MUSCLES. See ANATOMY, p. 215.

SUBER, in botany. See QUERCUS.

SUBJECT, a perſon under the rule and dominion of a ſovereign prince or ſtate.

SUBJECT, is alſo uſed for the matter of an art or ſcience, or that which it conſiders, or whereon it is employed: thus the human body is the ſubject of medicine.

SUBJUNCTIVE, in grammar. See GRAMMAR.

SUBLIMATE, a chemical preparation, the baſis whereof is mercury or quick-ſilver. See CHEMISTRY, p. 138.

SUBLIMATION, the condenſing and collecting in a ſolid form, by means of veſſels aptly conſtructed, the fumes of bodies raiſed from them by the application of a proper heat. See CHEMISTRY, p. 138.

SUBLINGUAL GLANDS. See ANATOMY, p. 307.

SUBMISSION, in Scots law. See LAW, Tit. xxxii. 15.

SUBORDINATION, a relative term, expreſſing the degree of inferiority between one thing and another.

SUBORNATION OF PERJURY, in Scots law. See LAW, Tit. xxxiii. 35.

SUBPOENA, in law, a writ whereby all common perſons, or thoſe under the degree of peerage, may be called into chancery, in any caſe where the law cannot afford a remedy.

SUBREPTION, the act of obtaining a favour from a ſuperior, by ſurpriſe or a falſe repreſentation.

SUBREPTITIOUS, a term applied to a letter, licence, patent, or other act, fraudulently obtained of a ſuperior, by concealing ſome truth, which, had it been known, would have prevented the conceſſion or grant.

SUBROGATION, in the civil law, the act of ſubſtituting a perſon in the place, and entitling him to the rights of another.

SUBSCAPULARIS, in anatomy. See ANATOMY, p. 196.

SUBSCRIPTION, in general, ſignifies the ſignature put at the bottom of a letter, writing, or inſtrument.

SUBSEQUENT, ſomething that comes after another, particularly with regard to the order of time.

SUBSIDY, in law, ſignifies an aid or tax granted to the king, by parliament, for the neceſſary occaſions of the kingdom; and is to be levied on every ſubject of ability, according to the rate or value of his lands or goods: but this word, in ſome of our ſtatutes, is confounded with that of cuſtoms.

SUBSISTENCE, in the military art, is the money paid to the ſoldiers weekly, not amounting to their full pay; becauſe their cloaths, accoutrements, tents, bread, *&c.* are to be paid.

SUBSTANCE, ſomething that we conceive to ſubſiſt of itſelf, independently of any created being, or any particular mode or accident. See METAPHYSICS.

SUBSTANTIAL, in the ſchools, ſomething belonging to the nature of ſubſtance.

SUBSTANTIVE, in grammar. See GRAMMAR.

SUBSTITUTE, a perſon appointed to officiate for another, in caſe of abſence or other legal impediment.

SUBSTITUTION, in the civil-law, a diſpoſition of a teſtament, whereby the teſtator ſubſtitutes one heir for another, who has only the uſufruit, and not the property of the thing left him.

SUBSTRACTION, in arithmetick. See ARITHMETICK, p. 370.

SUBSTRACTION, in algebra. See ALGEBRA, p. 81.

SUBTENSE, in geometry, the ſame with the chord of an arch. See CHORD.

SUBTERRANEOUS, whatever is under-ground: thus, naturaliſts ſpeak of ſubterraneous fires, damps, *&c.*

SUBTILE, in phyſics, an appellation given to whatever is extremely ſmall, fine, and delicate; ſuch as the animal ſpirits, the effluvia of odorous bodies, *&c.* are ſuppoſed to be.

SUBULARIA, in botany, a genus of the tetradynamia ſiliculoſa claſs. The pod is entire, oval, with oval concave valves; and the ſtylus is ſhorter than the pod. There is but one ſpecies, *viz.* the aquatica, or awl-wort, a native of Britain.

SUBULATED, ſomething in the ſhape of an awl.

SUCCEDANEUM, in pharmacy, denotes a drug ſubſtituted in the place of another, in medical compoſition.

SUCCESSION, in philoſophy, an idea which we get by reflecting on that train of ideas conſtantly following one another in our minds when awake.

SUCCESSION, in Scots law. See LAW, Tit. xxvii. 1, *&c.* xxviii. 1, *&c.*

SUCCESSOR, in law, one that ſucceeds, or comes in the place of another.

SUCCINUM, in natural hiſtory. See AMBER.

SUCCISA, in botany. See SCABIOSA.

SUCCORY, in botany. See CICHORIUM.

SUCCUBUS, a term uſed by ſome imaginary writers, for a dæmon who aſſumes the ſhape of a woman, and as ſuch lies with a man; in which ſenſe, it ſtands oppoſed to incubus, which was a dæmon in form of a man, that they ſuppoſed to lie with a woman.

But the truth is, the ſuccubus is only a ſpecies of the incubus, or night-mare. See MEDICINE, p. 157.

SUCCULA, in mechanics, a bare axis, or cylinder, with ſtaves to move it round; but without any tympanum or peritrochium.

SUCCULENT PLANTS, thoſe whoſe leaves are thick, and abound with juice.

SUCHUEN, a province of China, bounded by that of Xenſi on the north, by Honam and Huquam on the eaſt, by Quecheu and Yunam on the ſouth, and by the mountains of India on the weſt: its chief town is Chingtu.

SUCKERS, in gardening, the ſame with off-ſets. See OFF-SETS.

SUCTION, the act of ſucking or drawing up a fluid, as air, water, milk, or the like, by means of the mouth and lungs. See PNEUMATICS, and HYDROSTATICS.

SUDATORY, a name given by the ancient Romans to their hot or ſweating-rooms; ſometimes alſo called laconica.

SUDBURY, a borough-town of Suffolk, thirteen miles ſouth of Bury. It ſends two members to parliament.

SUDORIFIC, an appellation given to any medicine that cauſes or promotes ſweat.

SUEZ, a port-town of Egypt, ſituated at the bottom of the Red-ſea, ſeventy miles eaſt of Cairo: it is from this town that the iſthmus of Suez, which joins Africa to Aſia, takes its name.

SUFFOCATION, in medicine, the privation of reſpiration, or breathing; which is ſometimes occaſioned by a congeſtion of blood in the lungs, ſo as to prevent the ingreſs of the air.

SUFFOLK, a county of England, bounded by Norfolk on the north, by the German-ſea on the eaſt, by Eſſex, from which it is ſeparated by the river Maningtree, on the ſouth, and by Cambridgeſhire on the weſt; being ſixty two miles long, and twenty-eight broad.

SUFFRAGAN, an appellation given to ſimple biſhops with reſpect to archbiſhops, on whom they depend, and to whom appeals lie from the biſhops courts.

SUFFRAGE, denotes a vote given in an aſſembly, where ſomething is deliberated on, or where a perſon is elected to an office or benefice.

SUFFRUTEX, among botaniſts, denotes an under-ſhrub, or the loweſt kind of woody plants, as lavender, rue, *&c.*

SUGAR, in natural hiſtory, is properly the eſſential ſalt of the ſugar-cane, as tartar is of the grape. See CHEMISTRY, p. 161. and SACCHARUM.

This plant riſes to eight, nine, or more feet high; the ſtalk,

ſtalk, or cane, being round, jointed, and two or three inches in diameter at the bottom: the joints are three or four inches aſunder, and in a rich ſoil more: the leaves are long and narrow, and of a yellowiſh green colour; as is alſo the ſtalk itſelf, the top of which is ornamented with a panicle, or cluſter of arundinacecus flowers, two or three feet in length.

They propagate the ſugar-cane, by planting cuttings of it in the ground in furrows, dug parallel for that purpoſe; the cuttings are laid level and even, and are covered up with earth; they ſoon ſhoot out new plants from their knots or joints: the ground is to be kept clear, at times, from weeds; and the canes grow ſo quick, that in eight, ten, or twelve months, they are fit to cut for making of ſugar from them. The manner of doing it is thus: They cut off the reeds at one of the joints near the roots; they are then cleared of the leaves, and tied up in bundles, and ſent to the mills, which are worked either by water or horſes.

The ſugar-mill is compoſed of three rollers of an equal ſize, and all armed with iron-plates, where the canes are to paſs between them; only the middle roller is much higher than the reſt, to give the larger ſweep to the two poles to which the horſes are yoked. This great roller in the middle is furniſhed with a cog full of teeth, which catch the notches in the two ſide-rollers, and force them about to bruiſe the canes, which paſs quite round the great roller, and come out dry and ſqueezed from all their juice; which runs into a veſſel or back under the mill, and is thence conveyed through a narrow ſpout into the firſt boiler.

After the juice is let out of the firſt veſſel, it is received into another; in which it is boiled more briſkly, and ſcummed from time to time with a large kind of ſpoon, pierced with holes to let the liquor through, while it retains the ſcum and foulneſs ſeparated from it in boiling: towards the end of this boiling, they throw into it a ſtrong lixivium of wood-aſhes, with ſome quick-lime among it: this greatly promotes the ſeparation of the foulneſs that yet remains amongſt it; and, after it has boiled ſome time with this addition, they ſtrain it off. The fæces left in the cloths make a kind of wine, when fermented properly with water. The ſtrained liquor, which is now tolerably clean, is let into a third boiler, in which it is boiled down to the conſiſtence of ſugar over a very briſk fire, the people who attend it continually ſtirring and ſcumming it.

Great caution is to be uſed that the boiling matter does not riſe over the ſides of the veſſel, which would be of very dangerous conſequence: they prevent this by taking up quantities of the boiling matter with a ladle, lifting it up high, and letting it run in again, and by now and then adding a ſmall piece of butter, or fat of ſome kind, which takes down the bubbling almoſt inſtantaneouſly. They are very careful that no lemon-juice, or any other acid of that kind, comes near the veſſels, a very ſmall admixture of that being ſufficient to keep the matter from granulating. When the liquor is boiled enough, which is known by its concreting on throwing a ſpoonful of it up into the air, it is then let out into a fourth veſſel, under which there is a very gentle fire, only kept up that it may have leiſure to granulate; when it has begun to granulate, it is let out of this laſt boiler into a kind of conic earthen veſſels, open at both ends; the wideſt aperture is placed upwards, and the ſmaller end downwards, its aperture being ſtopped with a wooden plug. It is left in theſe veſſels twenty-four hours to concrete: after this they are removed into ſugar-houſes, and are there arranged in regular order, with a veſſel of earthen-ware under each; the plug is then taken out of the bottom aperture of each, and they are left in this condition for about forty days, that all the thick liquor, or melaſſes, may run from them: after they have ſtood thus long to drain of themſelves, a quantity of clay is diluted, with water, into a thin paſte; and this is poured on the top of every parcel of ſugar in the veſſels, ſo as to cover it two or three inches deep. This water, by degrees, all leaves the clay, and penetrating into the maſs of ſugar, runs through it, and carries off yet more of this foul thick liquid with it, into the veſſels placed underneath to receive it.

When the clay is quite dry, it is taken off, and the firſt preparation of the ſugar is now finiſhed; they ſhake it out of the veſſels, and, cutting it into lumps, which are of a dirty, browniſh, or greyiſh colour, they put it up in hogſheads, and other caſks, under the name of grey or brown ſugar. The ſugar, in this ſtate, ought to be dry, not unctuous, and to have no taſte of burning. The liquor which has run from the ſugar in ſtanding, is boiled to a conſiſtence, and ſold under the name of melaſſes, or treacle; this affords, by fermentation, a very clean and good ſpirit.

This coarſe ſugar is afterwards refined to various degrees of purity by new ſolutions, and is ſold at different prices, and under different names, according to the degree of purity it is brought to. Our ſugar refiners firſt diſſolve it in water, then clarify the ſolution by boiling with whites of eggs and deſpumation; and after due evaporation pour it into moulds; where the fluid part being drained off, and the ſugar concreted, its ſurface is covered with moiſt clay, as before. The ſugar thus once refined, by repetition of the proceſs becomes the double-refined ſugar of the ſhops. The candy-ſugar, or that in cryſtals, is prepared by boiling down ſolutions of ſugar to a certain pitch, and then removing them into a hot room, with ſticks placed acroſs the veſſel for the ſugar to ſhoot upon: and theſe cryſtals prove of a white or brown colour, according as the ſugar uſed in the proceſs was pure or impure.

SUGILLATION, in medicine, an extravaſation of blood in the coats of the eye, which at firſt appears of a reddiſh colour, and afterwards livid or black. If the diſorder is great, bleeding and purging are proper, as are diſcutients.

SUIT, in law, is uſed in different ſenſes; as, 1. For an action, whether perſonal or real. 2. Suit of court, or ſuit-ſervice, which is an attendance the tenant owes to his lord's court. 3. Suit-covenant, where a perſon has covenanted to do ſervice in the court of the lord. 4. Suit-cuſtom, which is where one and his anceſtors have owed ſuit time out of mind. 5. It is uſed for a petition to the king, or any perſon of dignity; where a lord diſtrains his tenant for ſuit, and none is due; in this caſe, the party may have an attachment againſt him to appear in the king's court. 6. Suit of the king's peace, is an action brought againſt a perſon for breach of the king's peace; as in the caſe of treaſons, felonies, or treſpaſſes.

SULPHUR. See CHEMISTRY, p. 72, 118.

SULTAN, a title of honour, given to the emperor of the Turks. The wife of a ſultan is called ſultana, and the favourite one hhaſeki-ſultana, *i. e.* the private ſultana.

SUM, ſignifies the quantity that ariſes from the addition of two or more magnitudes, numbers, or quantities together. See ARITHMETICK.

SUMACH, in botany. See RHUS.

SUMATRA, an iſland in the Eaſt-indian ocean, ſituated between 93° and 104° E. long. and between 5° 30′ N. lat. and 5° 30′ S. lat. extending from north-weſt to ſouth-eaſt, nine hundred miles long, and from one hundred to one hundred and fifty broad.

SUMMARY, in matters of literature. See ABRIDGEMENT.

SUMMER, one of the ſeaſons of the year, commencing in theſe northern regions on the day the ſun enters Cancer, and ending when he quits Virgo. See ASTRONOMY, p. 554.

SUMMIT, the top or vertex of any body, or figure; as of a triangle, cone, pyramid, *&c.*

SUMMONS, in Scots law. See LAW, Tit. xxx. 28.

SUN, in aſtronomy. See ASTRONOMY, p. 435.

SUN-FLOWER, in botany. See HELIANTHUS.

SUNDA-ISLANDS, thoſe ſituated near the ſtraits of Sunda, in the Indian ocean; the chief of which are Borneo, Java, Sumatra, *&c.* See BORNEO, *&c.*

SUNDAY, or the LORD'S-DAY, a ſolemn feſtival obſerved by Chriſtians on the firſt day of every week, in memory of our Saviour's reſurrection.

This is the principal and moſt noted of the Chriſtian feſtivals, and was obſerved with great veneration in the ancient church, from the time of the apoſtles, who themſelves are often ſaid to have met on that day for divine ſervice. It is likewiſe called the Sabbath-day, as being ſubſtituted in the room of the Jewiſh ſabbath. See SABBATH.

The ancients retained the name Sunday, or *dies ſolis*, in compliance with the ordinary forms of ſpeech, the firſt day of the week being ſo called by the Romans, becauſe it was dedicated to the worſhip of the ſun.

SUNDERLAND, a port-town of Durham, ſituated on the German ſea, at the mouth of the river Ware, ten miles north-eaſt of Durham city.

SUNTGOW, a territory in the circle of the upper Rhine in Germany, bounded by Alſace on the north; by the river Rhine, which divides it from the Briſgow, on the eaſt; by Switzerland on the ſouth; and by Franche-Compte on the weſt.

SUOVETAURILIA, an ancient Roman ſacrifice, ſo called becauſe it conſiſted of a pig (*ſus*), a ſheep, or rather ram (*ovis*), and a bull (*taurus*.) They were all males, to denote the maſculine courage of the Roman people. It was likewiſe called ſolitaurilia, becauſe the animals offered up were always (*ſolida*) whole or uncut.

SUPERCARGO, a perſon employed by merchants to go a voyage, and overſee their cargo, or lading, and diſpoſe of it to the beſt advantage.

SUPERCILIUM, in anatomy. See ANATOMY, p. 294.

SUPEREROGATION, in theology, what a man does beyond his duty, or more than he was commanded to do.

SUPERFETATION, a ſecond, or after conception, happening, when the mother, already pregnant, conceives of a latter coition; ſo that ſhe bears at once two fœtuſes of unequal age and bulk, and is delivered of them at different times. We meet with inſtances of ſuperfœtations in Hippocrates, Ariſtotle, Du Laurens, *&c.* But they are ſaid to be much more frequent in hares and ſows. Naturaliſts hold, that female rats are frequently born with young rats in their wombs; and we are told of extraordinary inſtances of this kind in the female part of the human ſpecies, by Bartholine, Mentzelius, and in the hiſtory of the Royal Academy of Sciences.

SUPERFICIES, or SURFACE, in geometry, a magnitude conſidered as having two dimenſions; or extended in length and breadth, but without thickneſs or depth.

SUPERFINE, in the manufactories, a term uſed to expreſs the ſuperlative fineneſs of a ſtuff; thus a cloth, a camblet, *&c.* are ſaid to be ſuperfine, when made of the fineſt wool, *&c.* or when they are the fineſt that can be made.

SUPERINTENDANT, in the French cuſtoms, an officer who has the prime management and direction of the finances or revenues of the king.

SUPERIOR, ſomething raiſed above another, or that has a right to command another.

SUPERIOR, in Scots law. See LAW, Tit. x. 3.

SUPERLATIVE, in grammar, one of the three degrees of compariſon, being that inflection of nouns-adjective that ſerves to augment and heighten their ſignification, and ſhews the quality of the thing denoted to be in the higheſt degree. See GRAMMAR.

SUPERNUMERARY, ſomthing over and above a fixed number. In ſeveral of the offices are ſupernumerary clerks, to be ready on extraordinary occaſions.

SUPERSEDEAS, in law, is a writ which lies in divers caſes, and in general ſignifies a command to ſtay ſome of the ordinary proceedings in law, which, on good cauſe ſhewn, ought not to proceed.

SUPERSTITION, extravagant devotion, or religion wrong directed or conducted.

SUPERVISOR, a ſurveyor or overſeer.

It was formerly, and ſtill remains, a cuſtom among ſome perſons, to appoint a ſuperviſor of a will, to ſee that the executors thereof do punctually obſerve and perform the ſame.

SUPINATION, in anatomy, the action of a ſupinator-muſcle, or the motion whereby it turns the hand ſo as that the palm is lifted up towards heaven.

SUPINATOR, in anatomy. See ANATOMY, p. 198.

SUPPLEMENT, in matters of literature, an appendage to a book, to ſupply what is wanting therein.

SUPPORTED, in heraldry, a term applied to the uppermoſt quarters of a ſhield when divided into ſeveral quarters, theſe ſeeming as it were ſupported or ſuſtained by thoſe below. The chief is ſaid to be ſupported when it is of two colours, and the upper colour takes up two thirds of it. In this caſe it is ſupported by the colour underneath.

SUPPORTERS, in heraldry, figures in an atchievement placed by the ſide of the ſhield, and ſeeming to ſupport or hold up the ſame. Supporters are chiefly figures of beaſts: figures of human creatures, for the like purpoſe, are properly called tenants.

SUPPOSITORY, a kind of medicated cone, or ball, which is introduced to the anus for opening the belly. Suppo-

sitories are usually made of soap, sugar, alum, or a piece of tallow-candle, about the length of a man's thumb and the breadth of a finger, though they may be made smaller for children, and sometimes a little thicker for adults.

SUPPRESSION, in law, the extinction or annihilating of an office, right, rent, or the like.

SUPPRESSION, in medicine, is generally used for a retention of urine or the menses. See MEDICINE, p 160, 162.

SUPPURATION, the second way wherein an inflammation terminates, being a conversion of the inspissated blood and the soft adjacent parts, as the vessels and fat, into pus, or matter: which disorder, when it has not yet found an opening, is generally called an abscess. See MEDICINE and SURGERY.

SUPPURATIVES, or SUPPURATING MEDICINES, such as promote suppuration. See the preceding article.

SUPRACOSTALES, in anatomy. See ANATOMY, p. 215.

SUPRALAPSARY, in theology, a person who holds that God, without any regard to the good or evil works of men, has resolved, by an eternal degree, to save some and damn others. These are also called antelapsaries, and are opposed to sublapsaries and infralapsaries.

SUPRASPINATUS, in anatomy. See ANATOMY, p. 196.

SUPREMACY, the superiority or sovereignty of the king.

SURAT, a city and port-town of Hither India, in the province of Guzurat, or Cambaya, situated on the river Tapte, ten miles east of the Indian sea: in E. long. 72° 20′, N. lat. 21° 30′.

SURCHARGE, the same with overcharge, and whatever is above that which is just and right.

SURCOAT, a coat of arms to be worn over the body armour.

The surcoat is properly a loose thin taffaty coat, with arms embrodered or painted on it, such as is worn by heralds: anciently also used by military men over their armour, to distinguish themselves by.

SURCULUS, in the anatomy of plants, a word used to express that part of the branching of the ribs of a leaf, which is of a middle kind betwixt the great middle rib and the smallest reticular ramifications.

SURD. See ALGEBRA, p. 95.

SURETY, in law, generally signifies the same with bail. See BAIL.

SURFACE. See SUPERFICIES.

SURFEIT, in medicine, a sickness proceeding from the sensation of a load at the stomach, usually attended with eruptions, and sometimes with a fever. See MEDICINE.

SURGE, in the sea-language, the same with wave. See WAVE.

Also when heaving at the capstan, if the cable royal or messenger slip a little, they call it surging.

S U R G E R Y.

SURGERY, the art of curing all manner of wounds, and other disorders, where the application of the hand, assisted by proper instruments, is necessary.

Of PHLEBOTOMY.

WE begin with the operation of phlebotomy: because it is of all the most general. performed in most parts of the body, and by much the most frequent in use at this present day. By phlebotomy, or bleeding, we here intend the opening a vein, by a sharp-edged and pointed instrument of steel, for extracting a proper quantity of blood, either for the preservation or recovery of a person's health.

It is commonly enough known, that the operation of bleeding in the arm is performed on the veins that lie on the internal part of the cubit. There are several things worthy the surgeon's notice in this operation; some of which regard the things which are to be done preparatory to bleeding, some in the operation itself, others immediately after the performance of it. Preparatory to bleeding you should have in readiness (1.) A linen fillet, about an ell in length, and two fingers in breadth. (2.) Two small square bolsters. (3.) Porringers or vessels to receive the blood. (4.) A sponge with warm water. (5.) Some vinegar, wine, or Hungary water, to raise the patient's spirits if he should be inclinable to faint (6.) Two assistants, one to hold the porringer, the other to reach you any thing that you shall want. (7.) You must place your patient upon a couch; or, if he is very fearful of the operation, lay him upon a bed, lest he should fall into a swoon. Lastly, the operator should be as expert in bleeding with his left hand as with his right: For, as you are readier at bleeding in the right arm with your right hand, so when you are to open the veins of the left arm, you will find it necessary to use your left hand.

Though the operation is to be performed at once, with one puncture, yet many things are to be observed in order to render it successful. First, it is necessary for the surgeon to inspect his patient's arm diligently, that he may see the course of the veins: he must then take hold of the arm, and extend it towards his breast, tucking up the sleeve about a hand's breadth above the bend of the cubit, where he must make his ligature, rolling the fillet twice round, and fastening it with a knot. The veins being compressed, and the blood being stopped in its return, they will enlarge, and lie fairer to the eye. When you have bound up the arm in this manner, you let it go for a small time till the veins grow turgid. You are then to lay hold of the arm again in the same manner as we directed before, and extend it to your breast, having an assistant ready with the vessel in his hand, at a convenient distance for receiving the blood.

You are now to examine which vein lies fairest, and is therefore most proper to be opened. For you must observe, that in the arm there usually appear three principal veins. The first is called *Vena Cephalica*, and is found in the external part of the arm The second is termed *Basilica*, and lies on the internal part of the arm: In the right arm it is also called *Hepatica*; in the left, *Splenitica*. The third, which is obliquely situated between the former two, is called *Mediana*. The median and basilic veins, as they are larger than the cephalic, discharge a greater quantity of blood, but are attended with more danger in the operation: For

For a confiderable artery and the brachial nerve lie under the bafilic vein, and the tendon of the biceps mufcle under the median. But as they lie fairer to the eye, and are therefore more frequently the fubjects of the operations we are treating of than the cephalic vein, it is fafer and more eligible for the lefs experienced furgeons to open the bafilic, or at leaft the median vein.

When you have determined which vein to open, you are to perform the operation on that part which prefents itfelf faireft to you. But if the vein has frequently been opened, and the part which appears largeft and faireft is full of cicatrices, you are not to open above, but below the cicatrices, by which means the blood will difcharge itfelf more freely: For the part above is generaly ftraitened by the cicatrix.

Before you apply the lancet to the fkin, when the veins are not rifen, it will be proper to rub the arm below the bandage, which will drive the blood back towards the cubit, and render the veins more turgid. Whilft this is doing in the right arm, the furgeon fhould take hold of the patient's arm in fuch a manner that he may lay his thumb upon the vein he intends to open, to prevent the blood from flowing back, and to keep the vein from rolling. You are now to fix your eye upon that part of the vein which you intend to open, and taking the lancet with your right hand, fo placed that the thumb and firft finger may be fixed about the middle of the blade; the other fingers fhould reft gently upon the patient's arm, to prevent your hand from flipping.

Your lancet is now to be pufhed lightly and carefully forward by your thumb and fore-finger, till it has penetrated through the coats of the vein; and at that inftant to be raifed a little upwards, in order to enlarge the orifice of the wound, which will give a freer paffage to the blood. The moft common and convenient fize of an orifice is about twice the breadth of the back of an ordinary knife. You are to keep even between the two extremes of rafhnefs and timidity in making the puncture. For as in one cafe you will only divide the common integuments, and fo leave your work undone; fo in the other you will run the rifque of wounding the artery, nerve, or tendon.

Your aperture being thus made, and the inftrument drawn inftantly back, the blood will then rufh forth from the orifice either in a large or fmall ftream. In the mean time the blood muft be permitted to flow as long as it fhall be judged ufeful or neceffary; and if it fhould ftop too foon, as it often may from too great a ftricture of the bandage on the arm, it muft be flackened a little, by which means the compreffed artery being fet at liberty, the blood will flow from the orifice as at firft. If you find the orifice obftructed by too great a tenfion of the fkin, or an intrufion of the *membrana adipofa*, you ought in that cafe to return the bit of fat, by preffing with the finger or a warm fponge, and to relax the fkin by bending the arm a little. Laftly, if the orifice be obftructed by thick, grumous, or congealed blood, that impediment may be removed by wiping it with a fponge dipt in warm water.

But that the patient's arm may not become painful or languid, by holding it long extended, the furgeon fhould fupport it by the cubitus for a little while; and then give him a ftick, or other cylindric body, to turn round in his hand, that by the contractions of the flexor and extenfor mufcles of the fingers, the courfe of the blood may be accelerated towards the cubitus: which will ftill be further promoted, if the patient urges a little voluntary cough.

When there feems to be a fufficient quantity of blood difcharged, the ligature muft then be immediately taken off from above the elbow, and the fkin about the orifice muft next be gently ftroked or preffed together by the two fore-fingers of the left-hand; by which means the lips of the divided vein are more eafily compreffed and clofed. But while the furgeon is doing this with his left hand, he takes the fmalleft of the two compreffes, and applies it upon the incifion with his right-hand: but fo as to let what little blood may remain betwixt the orifice and the vein, be difcharged, before he impofes the comprefs. Over the firft or fmall comprefs he fhould impofe another that is a little larger, preffing them both gently on the orifice with his left thumb, till the bandage is laid acrofs.

Having applied your bandage, and drawn down the patient's fleeve over his arm; he fhould be ordered not to ufe it too early or violently, before the orifice is well clofed, which might excite a frefh hæmorrhage, an inflammation, fuppuration, or other bad accident. And if the patient fhould faint away foon after the operation, it may be then convenient to wet his noftrils with Hungary water or vinegar; and to fprinkle fome of the laft, or elfe cold water, in his face; and, efpecially in fummer-time, to let in the frefh and cool air, by opening the windows, *&c.* Alfo, if any wine or cordial water be at hand, you may give the languifhing patient a fmall draught thereof.

Of Bleeding *in the* Foot.

Bleeding in the foot is an operation of very old ftanding: it having been an obfervation made by the moft ancient phyficians, that phlebotomy in this part proved highly ferviceable in moft diforders of the head and breaft, and for an obftruction of the menftrual and hæmorrhoidal flux; upon which difcharges greatly depended the healthy ftate of both fexes. For thefe reafons they therefore denominated thofe veins of the foot, *Saphena* and *Cephalica:* the laft of which extends itfelf from the internal ancle to the great toe; and the firft, from the external *malleolus* to the fmaller toes. But why one of them fhould be thought or denominated more cephalic than the other, there is not the leaft reafon to be offered: fince bleeding from either of them has altogether the very fame effect. Therefore, the furgeon fhould always open that which lies faireft and moft confpicuous. But if the veins upon the *metatarfus*, or inftep of the foot, do not well appear, it may then be convenient to open one of thofe at the ancle, or about the calf or ham of the leg. Nor is the phlebotomift fo liable to injure any of the tendons in thefe laft parts as he is upon the *metatarfus*.

For the more eafy and fuccefsful apertion of thefe veins, the patient muft firft wafh both feet well for fome time in hot water; that when the veins become fufficiently turgid, the furgeon may take his choice of that which prefents faireft either in the right or left foot, without paying any deference to the diftinction of right or left in any of the forementioned diforders. Having fixed upon the particular foot and vein, your ligature muft be applied about two fingers breadth above the ancle; and then the patient muft return it into the warm water, while the furgeon takes out and prepares his inftrument or lancet. Then kneeling down on one knee, the furgeon takes out the patient's foot from the warm water, and having wiped it dry with a napkin, places it upon his other knee, or elfe upon a board laid over the veffel of hot

hot water. He now faſtens or ſecures down the vein from ſlipping with his left hand. But if the veins do not appear well under the ancles, the ligature muſt be removed higher, about two fingers breadth above where you intend to make the apertion of the vein which beſt offers itſelf.

The blood from the vein thus opened may be received into a baſon; and if it does not flow freely from the orifice, the foot ſhould be returned into the warm water, which will either prevent or diſſolve the congealing of the blood that in this caſe often obſtructs the aperture. When a ſufficient quantity of blood has been thus drawn, which may be known partly from the time, and partly from the largeneſs of the ſtream, as alſo from the redneſs of the water, and condition or ſtrength of the patient; the orifice is then to be cloſed by the finger, and after drying the foot with a napkin, to be ſecured by compreſſes and bandages.

Of Bleeding *in the Veins of the* Forehead, Temples, *and* Occiput

There are many phyſicians and ſurgeons, who think that bleeding by the veins of the forehead and temples is much more ſerviceable and expeditious in relieving all diſorders of the head, ſuch as violent pains, vertigo, delirium, melancholy, and raving madneſs, *&c.* than the like diſcharge by veins more remote from the parts affected; judging that their vicinity renders them more capable of evacuating the offending matter of the diſeaſe. Before proceeding to cut the veins, an handkerchief or neckcloth ought to be drawn tight round the neck; that, by compreſſing the jugular vein, thoſe branches of it may become more turgid and conſpicuous. The vein being opened, the patient muſt hold down his head, that the blood may not trickle from his forehead into his eyes or mouth, when the ſtream does not ſpin out with ſufficient force. If the blood does not ſtop of itſelf after a due quantity is diſcharged, you muſt compreſs the orifice with your finger; and, after wiping the forehead and face, apply a compreſs or two, and then your bandage.

Bleeding from the occipital veins, which communicate with the lateral ſinuſſes of the *dura mater*, is both by reaſon and experience proved to be ſerviceable in moſt diſorders of the brain, where that part is overcharged with blood, which may be this way diverted and evacuated. The celebrated anatomiſt Morgagni eſpecially recommends it, with ſcarification and cupping in thoſe parts, for all lethargic diſorders.

Of Bleeding *in the* Jugular Veins *of the* Neck.

It has been a very ancient practice to bleed in the external jugular veins of the neck, for moſt inflammatory diſorders of the adjacent parts, for a quinſey, phrenzy, madneſs, ophthalmia, apoplexy, inveterate head-aches. lethargy, and other diſorders of the head. Nor are there wanting many among our modern ſurgeons and phyſicians to encourage the ſame practice, and that even from the authority of reaſon and experience; ſince the accumulated and obſtructed blood and humours may be this way diſcharged from the parts affected, and their bad conſequences prevented. Nor is the operation at all dangerous; ſince the jugular veins run on each ſide the neck from the head to the clavicles, immediately under the ſkin, and appearing generally very large, they may be eaſily perceived and opened: before which, you muſt make a ſtricture upon the lower part of the neck with a handkerchief, or the common ligature, which muſt be drawn tight by an aſſiſtant or the patient, to make the vein turgid and conſpicuous.

When the jugular veins have been by this means rendered turgid and conſpicuous, either of them which appears plaineſt may be ſecured by the finger for inciſion, either in the right or left ſide of the neck indifferently; when the diſorder lies in the whole head, or in the neck and fauces. But when only one ſide of the head, or one eye, is affected, the vein ought to be opened on the diſordered ſide of the neck. The requiſite quantity of the blood being taken, the ligature is next removed, and the orifice compreſſed with your finger, if the blood does not ſtop without while you wipe clean the neck, and then apply your compreſs and circular bandage. Thus the blood ſtops without any danger of a freſh hæmorrhage. Laſtly, it muſt be acknowledged, that the patient faints away as readily after bleeding in the neck, as the jugular veins are ſafely and eaſily opened: but no danger follows from thence.

Of Bleeding *in the* Veins, *called* Ranulæ, *under the Tongue.*

It is very often found of no ſmall ſervice in a quinſey, or other inflammatory diſorder of the neck, to bleed in the two ſmall veins which run under the tip or end of the tongue: eſpecially if a larger vein has been opened before, either in the neck, foot, or arm, whereby the inſpiſſated and ſtagnated blood may be gradually evacuated. To bleed in theſe veins, a ſtricture being made upon the neck as before, you then elevate the *apex* of the tongue with your left hand, while, with the lancet in your right, you circumſpectly open firſt one, and then the other on each ſide; becauſe the apertion of one only will hardly ever diſcharge blood enough to give any conſiderable relief. When you judge a ſufficient quantity of blood has run out of the mouth into your veſſel, remove the ligature from the neck: upon which the flux uſually ſtops of itſelf. But if it ſhould ſtill continue, let the patient take a little vinegar or *Frontiniac* wine in his mouth: or elſe you may apply a bit of vitriol or allum, or a compreſs dipt in ſome ſtyptic liquor, till the hæmorrhage ceaſes; which can never be dangerous even without ſuch topics.

Of Phlebotomy *in the* Penis.

Bleeding in the *vena dorſalis penis* uſually ſurpaſſes the benefit of all remedies whatever in abating inflammatory diſorders of this member. This large vein, which runs along the back or upper ſide of the *penis*, being generally pretty much diſtended, and conſpicuous in an inflammation of this part, may be inciſed about the middle or back part of the penis; and kept bleeding till the member becomes flaccid, and a ſufficient quantity of blood be diſcharged proportionable to the urgency of the ſymptoms. This done, you muſt apply a compreſs, and the bandage proper for the penis. But you muſt carefully endeavour to avoid injuring the arteries or nerves which enter the penis near this vein; as alſo not to make your bandage too ſtrict: for by theſe means the inflammation and ſymptoms may turn out worſe than before.

Of Wounds.

To conceive rightly of the nature and treatment of wounds, under the variety of diſorders that they are ſubject to, it will be proper firſt to learn, what are the appearances in the

the progress of healing a large wound, when it is made with a sharp instrument, and the constitution is pure.

In this circumstance, the blood-vessels, immediately upon their division, bleed freely, and continue bleeding till they are either stopped by art, or at length contracting and withdrawing themselves into the wound, their extremities are shut up by the coagulated blood. The hæmorrhage being stopped, the next occurrence, in about twenty-four hours, is a thin serous discharge; and, a day or two after, an increase of it, though somewhat thickened, and stinking. In this state it continues two or three days without any great alteration, from which time the matter grows thicker and less offensive; and when the bottom of the wound fills up with little granulations of flesh, it diminishes in its quantity, and continues doing so till the wound is quite skinned over.

The first stage of healing, or the discharge of matter, is by surgeons called *digestion*: the second, or the filling up with flesh, *incarnation*; and the last, or skinning over, *cicatrization*.

It is worth observing, that the loss of any particular part of the body can only be repaired by the fluids of that distinct part; and as in a broken bone, the *callus* is generated from the ends of the fracture, so, in a wound, is the cicatrix from the circumference of the skin only: Hence arises the necessity of keeping the surface even, either by pressure or eating medicines, that the eminence of the flesh may not resist the fibres of the skin in their tendency to cover the wound. This eminence is composed of little points or granulations called *fungus*, or proud flesh, and is frequently esteemed an evil, though in truth this species of it be the constant attendant on healing wounds; for when they are smooth, and have no disposition to shoot out above their lips, there is a slackness to heal, and a cure is very difficultly effected. Since then a *fungus* prevents healing only by its luxuriancy, and all wounds cicatrise from their circumference, there will be no occasion to destroy the whole *fungus* every time it rises, but only the edges of it near the lips of the skin; which may be done by gentle escharotics, such as lint dipt in a mild solution of *vitriol*, or for the most part only by dry lint, and a tight bandage, which will reduce it sufficiently to a level, if applied before the *fungus* have acquired too much growth. In large wounds, the application of corrosive medicines to the whole surface, is of no use; because the *fungus* will attain but to a certain height, when left to itself, which it will be frequently rising up to, though it be often wasted; and as all the advantage to be gathered from it, is only from the evenness of its margin, the purpose will be as fully answered by keeping that under only, and an infinite deal of pain avoided from the continual repetition of escharotics.

From what has been said of the progress of a wound made by a sharp instrument, where there is no indisposition of body, we see the cure is performed without any interruption, but from the *fungus*; so that the business of surgery will consist principally in a proper regard to that point, and in applications that will the least interfere with the ordinary course of nature, which in these cases will be such as act the least upon the surface of the wound; and agreeably to this we find, that dry lint only is generally the best remedy through the whole course of dressing: at first, it stops the blood with less injury than any styptick powders or waters; and afterwards, by absorbing the matter, which in the beginning of suppuration is thin and acrimonious, it becomes in effect a digestive: during incarnation it is the softest medium that can be applied between the roller and tender granulations, and at the same time is an easy compress upon the sprouting *fungus*.

Over the dry lint, may be applied a pledgit of some soft ointment spread upon tow, which must be renewed every day, and preserved in its situation by a gentle bandage; though in all large wounds, the first dressing, after that of the accident or operation, should not be applied in less than three days, when, the matter being formed, the lint separates more easily from the part; in the removal of which, no force should be used, but only so much be taken away as is loose and comes off without pain.

Of Inflammations *and* Abscesses.

As almost all abscesses are the consequences of inflammations, and these produce a variety of events, as they are differently complicated with other disorders, it will be proper first to make some inquiry into their disposition. Inflammations from all causes have three ways of terminating; either by dispersion, suppuration, or gangrene.

But though every kind of inflammation will sometimes terminate in different shapes, yet a probable conjecture of the event may be always gathered from the state of the patient's health. Thus inflammations happening in a slight degree upon colds, and, without any foregoing indisposition, will most probably be dispersed: those which follow close upon a fever, or happen to a very gross habit of body, will generally impostLumate: and those which fall upon very old people, or dropsical constitutions, will have a strong tendency to gangrene.

If the state of an inflammation be such, as to make the dispersion of it safely practicable, that end will be best brought about by evacuations, such as plentiful bleeding and repeated purges: the part itself must be treated with fomentations twice a day; and if the skin be very tense, it may be embrocated with a mixture of three fourths of oil of roses, and one fourth of common vinegar, and afterwards be covered with *unguent flor samb.* or a soft ointment made of white wax and sweet oil, spread upon a fine rag, and rolled on gently. If after four or five days, the inflammation begin to subside, the purging-waters and manna may take place of other purges, and the embrocation of oil and vinegar be now omitted, or sooner, if it has begun to excoriate. The ointment of wax and oil may be continued to the last. During the cure a thin diet is absolutely necessary, and in the height of the inflammation the drinking of thin liquors is of great service.

Here we have supposed that the inflammation had so great a tendency to discussion, as, by the help of proper assistance, to terminate in that manner; but when it happens that the disposition of the tumour resists all discutient means, we must then desist from any farther evacuations, and assist nature in the bringing on a suppuration.

That matter will most likely be formed, we may judge from the increase of the symptomatic fever, and enlargement of the tumour, with more pain and pulsation; and if a small rigor come on, it is hardly to be doubted. Inflammations after a fever, and the small-pox, almost always suppurate; but these presently discover their tendency, or at least should be at first gently treated, as though we expected an imposthumation. It is a maxim laid down in surgery,

gery, that evacuations are pernicious in every circumſtance of a diſeaſe, which is at laſt to end in ſuppuration: But as phyſicians do now acknowledge, that bleeding on certain occaſions in the ſmall-pox, is not only no impediment to the maturation, but even promotes it; ſo in the formation of abſceſſes, when the veſſels have been clogged, and the ſuppuration has not kindly advanced, bleeding has ſometimes quickened it accordingly; but, however, this practice is to be followed with caution. Purges are, no doubt, improper at this time; yet if the patient be coſtive, he muſt be aſſiſted with gentle clyſters every two or three days.

Of all the applications invented to promote ſuppuration, there are none ſo eaſy as poultices; but as there are particular tumours very ſlow of ſuppuration, and almoſt void of pain (ſuch, for inſtance, are ſome of the ſcrophulous ſwellings) it will be leſs troubleſome in theſe caſes to wear the gum-plaſters, which may be renewed every four or five days only. Amongſt the ſuppurative poultices, perhaps there is none preferable to that made of bread and milk ſoftened with oil; at leaſt the advantage of any other over it is not to be diſtinguiſhed in practice. The abſceſs may be covered with the poultice twice a-day, till it come to that ripeneſs as to require opening, which will be known by the thinneſs and eminence of the ſkin in ſome part of it, a fluctuation of the matter, and generally ſpeaking, an abatement of the pain previous to theſe appearances.

The ſigns of a gangrene are theſe: the inflammation loſes its redneſs, and becomes duſkiſh and livid; the tenſeneſs of the ſkin goes off, and feels to the touch flabby or emphyſematous; veſications filled with ichor of different colours ſpread all over it; the tumour ſubſides, and, from a duſkiſh complexion, turns black; the pulſe quickens and ſinks, and profuſe ſweats coming on, at laſt grow cold, and the patient dies.

To ſtop the progreſs of a mortification, the method of treatment will be nearly the ſame, from whatever cauſe it proceed, except in that ariſing from cold: in which caſe, we ought to be cautious not to apply warmth too ſuddenly to the part, if it be true, that in the northern countries they have daily conviction of gangrenes produced by this means, which might have been eaſily prevented by avoiding heat; nay, they carry their apprehenſion of the danger of ſudden warmth ſo far as to cover the part with ſnow firſt, which they ſay ſeldom fails to obviate any ill conſequence.

The practice of ſcarifying gangrenes, by ſeveral inciſions, is almoſt univerſal: and with reaſon; ſince it not only lets the parts free, and diſcharges a pernicious ichor, but makes way for whatever efficacy there may be in topical applications. Theſe are different with different ſurgeons: but the digeſtives ſoftened with oil of turpentine are as good dreſſings as any for the ſcarifications; and upon them, all over the part, may be laid the *theriaca Londinenſis*, which ſhould be always uſed in the beginning of a gangrene before the neceſſity of ſcarifying ariſes; or what is equally good, if not often preferable, a cataplaſm made with lixivium and bran, and applied warm, which will retain its heat better than moſt other topicals. Medicines alſo given internally are beneficial, and theſe ſhould conſiſt of the cordial kind; but the bark is the ſovereign remedy for this diſorder: after the ſeparation of the eſchar, the wound becomes a common ulcer, and muſt be treated as ſuch.

There are two ways of opening an abſceſs; either by inciſion, or cauſtick; but inciſion is preferable in moſt caſes. In ſmall abſceſſes, there is ſeldom a neceſſity for greater dilatation than a little orifice made with the point of a lancet; and in large ones, where there is not a great quantity of ſkin diſcoloured and become thin, an inciſion to their utmoſt extent will uſually anſwer the purpoſe; or if there be much thin diſcoloured ſkin, a circular or oval piece of it muſt be cut away; which operation, if done dexterouſly with a knife, is much leſs painful than by cauſtick, and at once lays open a great ſpace of the abſceſs, which may be dreſſed down to the bottom, and the matter of it be freely diſcharged; whereas, after a cauſtick, though we make inciſions through the eſchar, yet the matter will be under ſome confinement; and we cannot have the advantage of dreſſing properly till the ſeparation of the ſlough, which often requires a conſiderable time, ſo that the cure muſt be neceſſarily delayed; beſides that the pain of burning continuing two or three hours, which a cauſtick uſually requires in doing its office, draws ſuch a fluction upon the ſkin round the eſchar, as ſometimes to indiſpoſe it very much for healing afterwards. In the uſe of cauſticks, it is but too much a practice, to lay a ſmall one on the moſt prominent part of a large tumour, which not giving ſufficient vent to the matter, and perhaps the orifice ſoon after growing narrow, leads on to the neceſſity of employing tents; which two circumſtances more frequently make fiſtulas after an abſceſs, than any malignity in the nature of the abſceſs itſelf. The event would more certainly be the ſame after a ſmall inciſion; but ſurgeons not depending ſo much on ſmall openings by inciſion, as by cauſtick, do, when they uſe the knife, generally dilate ſufficiently: whereas, in the other way, a little opening in the moſt depending part of the tumour uſually ſatisfies them.

From this account of the method of opening abſceſſes, it does not appear often neceſſary to apply cauſticks; yet they have their advantages in ſome reſpects, and are ſeldom ſo terrible to patients as the knife, though in fact they are frequently more painful to bear. They are of moſt uſe in caſes where the ſkin is thin and inflamed: and we have reaſon to think the malignity of the abſceſs is of that nature as to prevent a quickneſs of incarning; in which circumſtance, if an inciſion only were made through the ſkin, little ſinuſes would often form, and burrow underneath, and the lips of it lying looſe and flabby, would become callous, and retard the cure, though the malignity of the wound were corrected: of this kind, are venereal buboes, which notwithſtanding they often do well by mere inciſion, yet when the ſkin is in the ſtate we have ſuppoſed, the cauſtick is always preferable: but this method ſhould be confined to venereal buboes; for thoſe which follow a fever, or the ſmall-pox, for the moſt part are curable by inciſion only. There are many ſcrophulous tumours, where the reaſoning is the ſame as in the venereal; and even in great ſwellings if the patient will not ſubmit to cutting, and the ſurgeon is apprehenſive of any danger in wounding a large veſſel, which is often done with the knife, yet as this inconvenience is avoided by cauſtick, it may on ſuch an occaſion be made uſe of; however, in ſcrophulous ſwellings of the neck and face, unleſs they are very large, cauſticks are not adviſeable, ſince in that part of the body, with length of time, they heal after inciſion. Cauſticks are of great ſervice in deſtroying ſtubborn ſcrophulous indurations of the glands, alſo venereal indurations of the glands of the groin, which will neither diſcuſs nor ſuppurate; likewiſe in expoſing carious bones, and making

making large iſſues. The beſt cauſtick in uſe is a paſte made with lime and *lixivium capitale*, which is to be prevented from ſpreading, by cutting an orifice in a piece of ſticking plaiſter, nearly as big as you mean to make the eſchar; which being applied to the part, the cauſtick muſt be laid on the orifice, and preſerved in its ſituation by a few ſlips of plaiſter laid round its edges, and a large piece over the whole. When iſſues are made, or bones expoſed, the eſchar ſhould be cut out immediately, or the next day: for if we wait the ſeparation, we miſcarry in our deſign of making a deep opening; ſince ſloughs are flung off by the ſprouting new fleſh underneath, which fills up the cavity at the ſame time that it diſcharges the eſchar; ſo that we are obliged afterwards to make the opening a ſecond time with painful eſcharotick medicines. To make an iſſue, or lay a bone bare, this cauſtick may lie on about four hours; to deſtroy a large gland, five or ſix; and to open abſceſſes, an hour and a half, two hours, or three hours, according to the thickneſs of the ſkin; and what is very remarkable, notwithſtanding its ſtrength and ſudden efficacy, it frequently gives no pain where the ſkin is not inflamed, as in making iſſues, and opening ſome few abſceſſes.

When an abſceſs is already burſt, we are to be guided by the probe where to dilate, obſerving the ſame rules with regard to the degree of dilatation as in the other caſe. The uſual method of dilating, is with the probe-ſciſſars; and indeed, in all abſceſſes, the generality of ſurgeons uſe the ſciſſars, after having firſt made a puncture with a lancet: but as the knife operates much more quickly, and with leſs violence to the parts than ſciſſars, which ſqueeze at the ſame time that they wound, it will be ſparing the patient a great deal of pain to uſe the knife, where-ever it is practicable, which is in almoſt all caſes, except ſome fiſtula's *in ano*, where the ſciſſars are more convenient. The manner of opening with a knife, is by ſliding it on a director, the groove of which prevents its being miſguided. If the orifice of the abſceſs be ſo ſmall as not to admit the director, or the blade of the ſciſſars, it muſt be enlarged by a piece of ſponge-tent; which is made by dipping a dry bit of ſponge in melted wax, and immediately ſqueezing as much out of it again as poſſible, between two pieces of tile or marble; the effect of which is, that the looſe ſpunge being compreſſed into a ſmall compaſs, if any of it be introduced into an abſceſs, the heat of the part melts down the remaining wax that holds it together, and the ſponge ſucking up the moiſture of the abſceſs, expands, and in expanding opens the orifice wider, and by degrees, ſo as to give very little pain.

The uſual method of dreſſing an abſceſs, the firſt time, is with dry lint only; or if there be no flux of blood, with ſoft digeſtives ſpread on lint. If there be no danger of the upper part of the wound reuniting too ſoon, the doſſils muſt be laid in looſe; but if the abſceſs be deep, and the wound narrow, as is the caſe ſometimes of abſceſſes *in ano*, the lint muſt be crammed in pretty tightly, that we may have afterwards the advantage of dreſſing down to the bottom without the uſe of tents, which, by reſiſting the growth of the little granulations of fleſh, in proceſs of time harden them, and in that manner produce a fiſtula; ſo that, inſtead of being uſed for the cure of an abſceſs, they never ſhould be employed but where we mean to retard the healing of the external wound, except in ſome little narrow abſceſſes, where, if they be not crammed in too large, they become as doſſils, admitting of incarnation at the bottom; but care ſhould be taken, not to inſinuate them much deeper than the ſkin in this caſe, and that they ſhould be repeated twice a-day, to give vent to the matter they confine. But tents do moſt good in little deep abſceſſes, whence any extraneous body is to be evacuated, ſuch as ſmall ſplinters of bone, *&c.*

The uſe of vulnerary injections into abſceſſes has been thought to bear ſo near a reſemblance to the uſe of tents, that they both fell into diſrepute almoſt at the ſame time.

Over the doſſils of lint may be laid a large pledgit of tow ſpread with baſilicon, which will lie ſofter than a defenſative plaiſter; for this, though deſigned to defend the circumference of wounds againſt inflammation or a fluction of humours, is often the very cauſe of them; ſo that the dreſſings of large wounds ſhould never be kept on by theſe plaiſters, where there is danger of ſuch accidents. In this manner, the dreſſings may be continued, till the cavity is incarned; and then it may be cicatriſed with dry lint, or ſome of the cicatriſing ointments, obſerving to keep the *fungus* down, as directed before.

In the courſe of dreſſing it will be proper to have regard to the ſituation of the abſceſs, and as much as poſſible to make the patient favour the diſcharge by his ordinary poſture: and to this end alſo, as what is of greater importance than the virtue of any ointment, the diſcharge muſt be aſſiſted by compreſs and bandage: the compreſs may be made of rags or plaiſter; though the latter is ſometimes preferable, as it remains immoveable on the part it is applied to. The frequency of dreſſing will depend on the quantity of diſcharge: once in twenty-four hours is ordinarily ſufficient; but ſometimes twice, or perhaps three times, is neceſſary.

Of Ulcers.

When a wound or abſceſs degenerates into ſo bad a ſtate as to reſiſt the methods of cure above laid down, and loſes that complection which belongs to a healing wound, it is called an ulcer; and as the name is generally borrowed from the ill habit of the ſore, it is a cuſtom to apply it to all ſores that have any degree of malignity, though they be immediately formed without any previous abſceſs or wound; ſuch are the venereal ulcers of the tonſils, *&c.*

Ulcers are diſtinguiſhed by their particular diſorders, though it ſeldom happens that the affections are not complicated; and when we lay down rules for the management of one ſpecies of ulcer, it is generally requiſite to apply them to almoſt all others. However, the characters of moſt eminence are, the callous ulcer, the ſinous ulcer, and the ulcer with caries of the adjacent bone; tho' there be abundance more known to ſurgeons, ſuch as the putrid, the corroſive, the varicous, *&c.* but as they have acquired their names from ſome particular affection, we ſhall ſpeak of the treatment of them under the general head of ulcers.

It will be often in vain to purſue the beſt means of cure by topical application, unleſs we are aſſiſted by internal remedies; for as many ulcers are the effects of a particular indiſpoſition of body, it will be difficult to bring them into order, while the cauſe of them remains with any violence; though they are ſometimes in a great degree the diſcharge of the indiſpoſition itſelf, as in the plague, ſmall-pox, *&c.* But we ſee it generally neceſſary in the pox, the ſcurvy, obſtructions of the menſes, dropſies, and many other diſtempers, to give internals of great efficacy; and indeed, there are hardly any conſtitutions where ulcers are not aſſiſted by ſome phyſical regimen. Thoſe that are cancerous and

and ſcrophulous ſeem to gain the leaſt advantage from phyſic; for if in their beginnings they have ſometimes been very much relieved, or cured, by ſalivation, or any other evacuation, they are alſo often irritated and made worſe by them; ſo that there is nothing very certain in the effects of violent medicines in theſe diſtempers. Upon the whole, in both theſe caſes, the milk-diet, and gentle purgings with manna, and the waters, ſeem to be moſt efficacious; though briſk methods may be uſed with more ſafety in the evil than in the cancer; and ſometimes, particularly in young ſubjects, the decoction of the woods is extremely beneficial for ſcrophulous ulcers: but it has lately been atteſted by men of great ſkill and veracity, that ſea-water is more powerful than any other remedy hitherto known, both for ſcrophulous ulcers, and ſcrophulous tumours.

When an ulcer becomes foul, and diſcharges a naſty thin ichor, the edges of it, in proceſs of time, tuck in, and growing ſkinned and hard, give it the name of a callous ulcer, which, ſo long as the edges continue in that ſtate, muſt neceſſarily be prevented from healing: But we are not immediately to deſtroy the lips of it, in expectation of a ſudden cure; for while the malignity of the ulcer remains, which was the occaſion of the calloſity, ſo long will the new lips be ſubject to a relapſe of the ſame kind, however often the external ſurface of them be deſtroyed: ſo that when we have to deal with this circumſtance, we are to endeavour to bring the body of the ulcer into a diſpoſition to recover by other methods. It ſometimes happens to poor laborious people, who have not been able to afford themſelves reſt, that lying a-bed will in a ſhort time give a diverſion to the humours of the part, and the callous edges ſoftening, will without any great aſſiſtance ſhoot out a cicatrix, when the ulcer is grown clean and filled with good fleſh: the effect of a ſalivation is generally the ſame; and even an iſſue does ſometimes diſpoſe a neighbouring ulcer to heal: but though calloſities be frequently ſoftened by theſe means, yet when the ſurface of the ulcer begins to yield thick matter, and little granulations of red fleſh ſhoot up, it will be proper to quicken nature by deſtroying the edges of it, if they remain hard. The manner of doing this, is by touching them a few days with the lunar cauſtick, or *lapis infernalis*; and ſome chuſe to cut them off with a knife: but this laſt method is very painful, and not more efficacious; though when the lips do not tuck down cloſe to the ulcer, but hang looſe over it, as in ſome venereal buboes, where the matter lies a great way under the edges of the ſkin, the eaſieſt method is cutting them off with the ſciſſars.

To digeſt the ulcer, or to procure good matter from it when in a putrid ſtate, there are an infinity of ointments invented; but the *Baſilicon Flavum* alone, or ſoftened down ſometimes with turpentines, and ſometimes mixt up with different proportions of red precipitate, ſeems to ſerve the purpoſes of bringing an ulcer on to cicatriſation as well as any of the others. When the ulcer is incarned, the cure may be finiſhed as in other wounds; or if it do not cicatriſe kindly, it may be waſhed with *Aq. Calcis*, or *Aq. Phag.* or dreſſed with a pledgit dipt in *Tinct. Myhrræ:* and if excoriations are ſpread round the ulcer, they may be anointed with *Sperm. Cet.* ointment, or *Unguent. Nutritum.*

The *Red Precipitate* has of late years acquired the credit it deſerves for the cure of ulcers; but by falling into general uſe, is very often unſkilfully applied: when mixed with the *Baſilicon*, or, what is neater, a cerate of wax and oil, it is moſt certainly a digeſtive, ſince it hardly ever fails to make the ulcer yield a thick matter in twenty-four hours, which diſcharged a thin one before the application of it.

If the ulcer ſhould be of ſuch a nature as to produce a ſpongy fleſh, ſprouting very high above the ſurface, it will be neceſſary to deſtroy it by ſome of the eſcharoticks, or the knife. This fungus differs very much from that belonging to healing wounds, being more eminent and lax, and generally in one maſs; whereas the other is in little diſtinct protuberances. It approaches often towards a cancerous complexion, and when it riſes upon ſome glands does actually degenerate ſometimes into a cancer. When theſe excreſcences have ariſen in venereal ulcers, eſcharoticks ſhould be applied. Thoſe in uſe, are the *Vitriol*, the *Lunar Cauſtick*, the *Lapis Infernalis*, and more generally the red *Precipitate* powder.

It is but ſeldom, that theſe inveterate funguſes appear on an ulcer; but it is very uſual for thoſe of a milder kind to riſe, which may often be made to ſubſide with preſſure, and the uſe of mild eſcharoticks: however, if the aſpect of the ſore be white and ſmooth, as happens in ulcers accompanied with a dropſy, and often in young women with obſtructions, it will anſwer no purpoſe to waſte the excreſcences, until the conſtitution is repaired, when moſt probably they will ſink without any aſſiſtance. In ulcers alſo, where the ſubjacent bone is carious, great quantities of looſe flabby fleſh will grow up above the level of the ſkin: but as the caries is the cauſe of the diſorder, it will be in vain to expect a cure of the excreſcence, until the rotten part of the bone be removed; and every attempt with eſcharoticks will be only a repetition of pain to the patient without any advantage.

When the excreſcence is cancerous, and does not riſe from a large cancer, but only from the ſkin itſelf, it has been uſual to recommend the actual cautery; but it is better to cut away quite underneath, and dreſs afterwards with eaſy applications. As to the treatment of incurable cancerous ulcerations, after much trial, ſurgeons have at laſt diſcovered, that what gives the moſt eaſe to the ſore is the moſt ſuitable application; and therefore the uſe of eſcharoticks is not to be admitted on any pretence whatſoever; nor in thoſe parts of a cancer that are corroded into cavities, muſt the precipitate be made uſe of to procure digeſtion, or promote the ſeparation of the ſloughs. The beſt way, therefore, is to be guided by the patient what medicine to continue. Thoſe uſually preſcribed are preparations from lead; but what we have found moſt beneficial, have been ſometimes dry lint alone when it does not ſtick to the cancer; at other times, lint doſſils ſpread with *Baſilicon* or *Cerat. de Lapid. Calam.* and oftener than either with a *Cerate* made of oil and wax, or the *Sperm. Cet.* ointment; and over all, a pledgit of tow ſpread with the ſame. Embrocating the neighbouring ſkin and edges of it with milk, is of ſervice; but the chief good is to be acquired by diet, which ſhould be altogether of milk and things made of milk, though herbage may be admitted alſo. Iſſues in the ſhoulders or thighs do alſo alleviate the ſymptoms; and manna, with the purging waters, once, or perhaps twice a-week, will ſerve to keep the body cool.

When ulcers or abſceſſes are accompanied with inflammation and pain, they are to be aſſiſted with fomentations made of ſome of the dry herbs, ſuch as Roman wormwood, bay-leaves, and roſemary; and when they are very putrid and corroſive, which circumſtances give them the name of foul phagædenick ulcers, ſome ſpirits of wine ſhould be added to the fomentation, and the bandage be alſo dipt in brandy

or ſpirits of wine, obſerving in theſe caſes where there is much pain, always to apply gentle medicines till it be removed.

When the pain and inflammation are exceſſive, bleeding and other evacuations will often be ſerviceable: and above all things, reſt and a horizontal poſition: which laſt circumſtance is of ſo great importance to the cure of ulcers of the legs, that unleſs the patient will conform to it ſtrictly, the ſkill of the ſurgeon will often avail nothing; for as the indiſpoſition of theſe ſores is in ſome meaſure owing to the gravitation of the humours downwards, it will be much more beneficial to lie along than ſit upright, though the leg be laid on a chair; ſince even in this poſture they will deſcend with more force, than if the body was reclined.

In ulcers of the legs, accompanied with varices or dilatations of the veins, the method of treatment will depend upon the other circumſtances of the ſore; for the varix can only be aſſiſted by the application of bandage, which muſt be continued a conſiderable time after the cure. The neateſt bandage is the ſtrait ſtocking, which is particularly ſerviceable in this caſe; though alſo, if the legs be œdematous, or if, after the healing of the ulcers, they ſwell when the patient quits his bed, it may be worn with ſafety and advantage. There are inſtances of one vein only being varicous, which when it happens, may be deſtroyed by tying it above and below the dilation, as in an aneuriſm; but this operation ſhould only be practiſed where the varix is large and painful.

Ulcers of many years ſtanding are very difficult of cure; and in old people the cure is often dangerous, frequently exciting an aſthma, a diarrhœa, or a fever, which deſtroys the patient, unleſs the ſore break out again; ſo that it is not altogether adviſeable to attempt the abſolute cure in ſuch caſes, but only the reduction of them into better order, and leſs compaſs, which, if they be not malignant, is generally done with reſt and proper care. The cure of thoſe in young people may be undertaken with more ſafety; but we often find it neceſſary to raiſe a ſalivation to effect it, though, when completed it, does not always laſt; ſo that the proſpect of cure in ſtubborn old ulcers, at any time of life, is but indifferent. In all theſe caſes, however, it is proper to purge once or twice a-week with calomel, if the patient can bear it, and to make an iſſue when the ſore is almoſt healed, in order to continue a diſcarge the conſtitution has been ſo long habituated to, and prevent its falling from the cicatrix, and burſting out again in that place.

When an ulcer or abſceſs has any ſinuſes or channels opening and diſcharging themſelves into the ſore, they are called ſinous ulcers. Theſe ſinuſes, if they continue to drain a great while, grow hard in the ſurface of their cavity, and then are termed fiſtulæ, and the ulcer a fiſtulous ulcer; alſo, if matter be diſcharged from any cavity, as thoſe of the joints, abdomen, *&c.* the opening is called a ſinous ulcer, or a fiſtula.

The treatment of theſe ulcers depends upon a variety of circumſtances. If the matter of the ſinus be thick, ſtrict bandage and compreſs will ſometimes bring the oppoſite ſides of the ſinus to a re-union: if the ſinus grow turgid in any part, and the ſkin thinner, ſhewing a diſpoſition to break, the matter muſt be made to puſh more againſt that part, by plugging it up with a tent; and then a counter-opening muſt be made, which proves often ſufficient for the whole abſceſs, if it be not afterwards too much tented, which locks up the matter and prevents the healing; or too little, which will have the ſame effect; for dreſſing quite ſuperficially, does ſometimes prove as miſchievous as tents, and for nearly the ſame reaſon, ſince ſuffering the external wound to contract into a narrow orifice before the internal one be incarned, does almoſt as effectually lock up the matter as a tent: to preſerve then a medium in theſe caſes, a hollow tent of lead or ſilver may be kept in the orifice, which, at the ſame time that it keeps it open, gives vent to the matter. The abſceſſes where the counter opening are made moſt frequently, are thoſe of compound fractures, and the breaſt; but the latter do oftner well without dilatation than the former, though it muſt be performed in both, if practicable, the whole length of the abſceſs, when after ſome trial the matter does not leſſen in quantity, and the ſides of it grow thinner; and if the ſinuſes be fiſtulous, there is no expectation of cure without dilation. There are alſo a great many ſcrophulous abſceſſes of the neck, that ſometimes communicate by ſinuſes running under large indurations; in which inſtances, counter-openings are adviſeable, and generally anſwer without the neceſſity of dilating the whole length; and indeed there are few abſceſſes in this diſtemper, which ſhould be opened beyond the thinneſs of the ſkin. When abſceſſes of the joints diſcharge themſelves, there is no other method of treating the fiſtula, but by keeping it open with the cautions already laid down, till the cartilages of the extremities of the bones being corroded, the two bones ſhoot into one another, and form an anchyloſis of the joint, which is the moſt uſual cure of ulcers in that part.

Gun-ſhot wounds often become ſinuous ulcers, and then are to be conſidered in the ſame light as thoſe already deſcribed; though ſurgeons have been always inclined to conceive there is ſomething more myſterious in theſe wounds than any others: but their terribleneſs is owing to the violent contuſion and laceration of the parts, and often to the admiſſion of extraneous bodies into them, as the bullet, ſplinters, clothes, *&c.* and were any other force to do the ſame thing, the effect would be exactly the ſame as when done by fire-arms. The treatment of theſe wounds conſiſts in removing the extraneous body as ſoon as poſſible; to which end the patient muſt be put into the ſame poſture as when he received the wound: if it cannot be extracted by cutting upon it, which ſhould always be practiſed when the ſituation of the blood-veſſels, *&c.* does not forbid, it muſt be left to nature to work out, and the wound dreſſed ſuperficially; for we muſt not expect, that if it be kept open with tents, the bullet, *&c.* will return that way; and there is hardly any caſe where tents are more pernicious than here, becauſe of the violent tenſion and diſpoſition to gangrene which preſently enſue. To guard againſt mortification in this, and all other violently contuſed wounds, it will be proper to bleed the patient immediately, and ſoon after give a clyſter; the part ſhould be dreſſed with ſoft digeſtives, and the compreſs and roller applied very looſe, being firſt dipt in brandy or ſpirits of wine. The next time the wound is opened, if it be dangerous, the ſpirituous fomentation may be employed, and after that continued till the danger is over. If a mortification comes on, the applications for that diſorder muſt be uſed. In gun-ſhot wounds, it ſeldom happens that there is any effuſion of blood, unleſs a large veſſel be torn; but the bullet makes an eſchar, which uſually ſeparates in a few days, and is followed with a plentiful diſcharge; but when the wound is

come

come to this period, it is manageable by the rules already laid down.

When an ulcer with looſe rotten fleſh diſcharges more than the ſize of it ſhould yield, and the diſcharge is oily and ſtinking, in all probability the bone is carious; which may eaſily be diſtinguiſhed by running the probe through the fleſh: and if ſo, it is called a carious ulcer. The cure of theſe ulcers depends principally upon the removal of the rotten part of the bone, without which it will be impoſſible to heal, as we ſee ſometimes even in little ſores of the lower jaw, which taking their riſe from a rotten tooth, will not admit of cure till the tooth be drawn. Thoſe caries which happen from the matter of abſceſſes lying too long upon the bone, are moſt likely to recover: thoſe of the pox very often do well, becauſe that diſtemper fixes ordinarily upon the middle and outſide of the denſeſt bones, which admit of exfoliation; but thoſe produced by the evil, where the whole extremities of ſpongy parts of the bone are affected, are exceedingly dangerous, though all enlarged bones be not neceſſarily carious; and there are ulcers ſometimes on the ſkin that covers them, which do not communicate with the bone, and conſequently do well without exfoliation: nay, it ſometimes happens, though the caſe be rare, that, in young ſubjects particularly, the bones will be carious to ſuch a degree, as to admit a probe almoſt thro' the whole ſubſtance of them, and yet afterwards admit of a cure, without any notable exfoliation.

The method of treating an ulcer with a caries, is by applying a cauſtick of the ſize of the ſcale of the bone that is to be exfoliated, and after having laid it bare, to wait till ſuch time as the carious part can, without violence, be ſeparated, and then heal the wound. In order to quicken the exfoliation, there have been ſeveral applications deviſed; but that which has been moſt uſed in all ages, is the actual cautery, with which ſurgeons burn the naked bone every day, or every other day, to dry up, as they ſay, the moiſture, and by that means procure the ſeparation: but as this practice is never of great ſervice, and always cruel and painful it is now pretty much exploded. Indeed, from conſidering the appearance of a wound, when a ſcale of bone is taken out of it, there is hardly any queſtion to be made, but that burning retards rather than haſtens the ſeparation; for as every ſcale of a carious bone is flung off by new fleſh generated between it and the ſound bone, whatever would prevent the growth of theſe granulations, would alſo in a degree prevent the exfoliation; which muſt certainly be the effect of a red hot iron applied ſo cloſe to it; though the circumſtances of carious bones, and their diſpoſition to ſeparate, are ſo different from one another, that it is hardly to be gathered from experience, whether they will ſooner exfoliate with or without the aſſiſtance of fire, for ſometimes, in both methods, an exfoliation is not procured in a twelve month, and at other times it happens in three weeks or a month: however, if it be only uncertain whether the actual cautery be beneficial or not, the cruelty that attends the uſe of it ſhould entirely baniſh it out of practice. It is often likewiſe, in theſe caſes, employed to keep down the fungous lips that ſpread upon the bone; but it is much more painful than the eſcharotick medicines; though there will be no need of either, if a regular compreſs be kept on the dreſſings; or at worſt, if a flat piece of the prepared ſponge, of the ſize of the ulcer, be rolled on with a tight bandage, it will ſwell on every ſide, and dilate the ulcer without any pain.

Some caries of the bones are ſo very ſhallow, that they crumble inſenſibly away, and the wound fills up; but when the bone will neither exfoliate nor admit of granulations, it will be proper to ſcrape it with a rugine, or perforate it in many points with a convenient inſtrument down to the quick. In the evil, the bones of the *carpus* and *tarſus* are often affected, but their ſpongineſs is the reaſon that they are ſeldom cured: ſo that when theſe, or indeed the extremities of any of the bones, are carious through their ſubſtance, it is adviſeable to amputate; though there are inſtances in the evil, but more eſpecially in critical abſceſſes, where after long dreſſing down, the ſplinters, and ſometimes the whole ſubſtance of the ſmall bones, have worked away, and a healthy habit of body coming on, the ulcer has healed; but theſe are ſo rare, that no great dependence is to be laid on ſuch an event. The dreſſings of carious bones, if they are ſtinking, may be doſſils dipt in the tincture of myrrh; otherwiſe thoſe of dry lint are eaſieſt, and keep down the edges of the ulcer better than any other gentle applications.

Burns are generally eſteemed a diſtinct kind of ulcers, and have been treated with a greater variety of applications than any other ſpecies of ſore.

When burns are very ſuperficial, not raiſing ſuddenly any veſication, ſpirits of wine are ſaid to be the quickeſt relief; but whether they be more ſerviceable than embrocations with linſeed oil, is uncertain, though they are uſed very much by ſome perſons whoſe trade ſubjects them often to this misfortune. If the burn excoriates, it is eaſieſt to roll the part up gently with bandages dipt in ſweet oil, or a mixture of *unguent. flor ſambu.* with the oil: when the excoriations are very tender, dropping warm milk upon them every dreſſing is very comfortable; or if the patient can bear to have flannels wrung out of it, applied hot, it may be ſtill better: if the burn have formed eſchars, they may be dreſſed with *baſilicon*, though generally oil alone is eaſier; and in theſe ſores, whatever is the eaſieſt medicine will be the beſt digeſtive. There is great care neceſſary to keep down the *fungus* of burns, and heal the wounds ſmooth: to which end, the edges ſhould be dreſſed with lint dipt in *aqu. vitriol.* and dried afterwards; or they may be touched with the vitriol ſtone, and the dreſſings be repeated twice a day. There is alſo a greater danger of contractions from burns after the cure, than from other wounds; to obviate which, embrocations of neats-foot oil, and bandage with paſteboards, to keep the part extended, are abſolutely neceſſary, where they can be applied.

Explanation of Plate CLVII. fig. 1.

A, a director by which to guide the knife in the opening of abſceſſes that are burſt of themſelves, or firſt punctured with a lancet. This inſtrument ſhould be made either of ſteel, ſilver, or iron; but ſo tempered, that it may be bent and accommodated to the direction of the cavity. It is uſually made quite ſtraight; but that form prevents the operator from holding it firmly while he is cutting. The manner of uſing it is, by paſſing the thumb through the ring, and ſupporting it with the fore-finger, while the ſtraight-edged knife is to ſlide along the groove with its edge upwards, towards the extremity of the abſceſs.

B. The ſtraight-edged knife, proper for opening abſceſſes with the aſſiſtance of a director; but which, in few other reſpects, is preferable to the round-edged knife.

C, A crooked needle, with its convex and concave ſides ſharp;

sharp: this is used only in the suture of the tendon, and is made thin, that but few of the fibres of so slender a body as a tendon may be injured in the passing of it. This needle is large enough for stitching the *tendo Achillis*.

D, The largest crooked needle necessary for the tying of any vessels, and should be used with a ligature of the size it is threaded with in taking up the spermatick vessels in castration, or the femoral and humeral arteries in amputation. This needle may also be used in sewing up deep wounds.

E, A crooked needle and ligature of the most useful size, being not much too little for the largest vessels, nor a great deal too big for the smallest; and therefore in the taking up of the greatest number of vessels in an amputation, is the proper needle to be employed. This needle also is of a convenient size for sewing up most wounds.

F, A small crooked needle and ligature for taking up the lesser arteries, such as those of the scalp, and those of the skin that are wounded in opening abscesses.

Great care should be taken by the makers of these needles, to give them a due temper: for if they are too soft, the force sometimes exerted to carry them through the flesh, will bend them; if they are too brittle, they snap; both which accidents may happen to be terrible inconveniencies, if the surgeon be not provided with a sufficient number of them. It is of great importance also to give them the form of part of a circle, which makes them pass much more readily round any vessel, than if they were made partly of a circle, and partly of a straight line, and in taking up vessels at the bottom of a deep wound is absolutely necessary, it being impracticable to turn the needle with a straight handle, and bring it round the vessel when in that situation. The convex surface of the needle is flat, and its two edges are sharp. Its concave side is composed of two surfaces, rising from the edges of the needle, and meeting in a ridge or eminence, so that the needle has three sides. The best materials for making ligatures, are the flaxen thread that shoemakers use; which is sufficiently strong when four, six, or eight of the threads are twisted together and waxed; and is not so apt to cut the vessels, as threads that are more finely spun.

G, A straight needle, such as glovers use, with a three-edged point, useful in the uninterrupted suture, in the suture of tendons, where the crooked one *C*, is not preferred, and in sewing up dead bodies, and is rather more handy for taking up the vessels of the scalp.

Of Sutures.

When a wound is recent, and the parts of it are divided by a sharp instrument, without any farther violence, and in such a manner that they may be made to approach each other, by being returned with the hands, they will, if held in close contact for some time, re-unite by inosculation, and cement like one branch of a tree ingrafted on another. To maintain them in this situation, several sorts of sutures have been invented, and formerly practised; but the number of them has of late been very much reduced. Those now chiefly described, are the interrupted, the glover's, the quilled, the twisted, and the dry sutures; but the interrupted and twisted, are almost the only useful ones; for the quilled suture is never preferable to the interrupted; the dry suture is ridiculous in terms, since it is only a piece of plaister applied in many different ways to re-unite the lips of a wound; and the glover's, or uninterrupted stitch, which is advised in superficial wounds, to prevent the deformity of a scar, does rather, by the frequency of the stitches, occasion it, and is therefore to be rejected in favour of a compress and sticking plaister; the only instance where it should be used, is in a wound of the intestine.

Wounds are not fit subjects for suture, when there is either a contusion, laceration, loss of substance, great inflammation, difficulty of bringing the lips into apposition, or some extraneous body insinuated into them; though sometimes a lacerated wound may be assisted with one or two stitches. It has formerly been forbidden to sew up wounds of the head; but this precaution is very little regarded by the moderns.

If we stitch up a wound that has none of these obstacles, we always employ the interrupted suture, passing the needle two, three, or four times, in proportion to the length of it, though there can seldom be more than three stitches required.

The method of doing it is this: the wound being emptied of the grumous blood, and your assistant having brought the lips of it together, that they may lie quite even; you carefully carry your needle from without, inwards to the bottom, and so on from within, outwards; using the caution of making the puncture far enough from the edge of the wound, which will not only facilitate the passing the ligature, but will also prevent it from eating through the skin and flesh; this distance may be three or four tenths of an inch: as many more stitches as you shall make, will be only repetitions of the same process. The threads being all passed, you begin tying them in the middle of the wound, though, if the lips are held carefully together all the while, as they should be, it will be of no great consequence which is done first. The most useful kind of knot in large wounds, is a single one first; over this, a little linen compress, on which is to be made another single knot; and then a slip-knot, which may be loosened upon any inflammation: but in small wounds, there is no danger from the double knot alone, without any compress to tie it upon; and this is most generally practised. If a violent inflammation should succeed, loosening the ligature only will not suffice; it must be cut through and drawn away, and the wound be treated afterwards without any suture. When the wound is small, the less it is disturbed by dressing, the better; but in large ones, there will sometimes be a considerable discharge, and if the threads be not cautiously carried through the bottom of it, abscesses will frequently ensue from the matter being pent up underneath, and not finding issue. If no accident happen, you must, after the lips are firmly agglutinated, take away the ligatures, and dress the orifices which they leave.

It must be remembered, that during the cure, the suture must be always assisted by the application of bandage, if possible, which is frequently of the greatest importance; and that sort of bandage with two heads, and a slit in the middle, which is by much the best, will in most cases be found practicable.

The twisted suture being principally employed in the hare-lip, we shall reserve its description for the section on that head.

Of the Suture *of* Tendons.

Wounds of the tendons are not only known to heal again, but even to admit of sewing up like those of the fleshy parts,

parts, though they do not re-unite in so short a time. When a tendon is partly divided, it is generally attended with an excessive pain, inflammation, *&c.* in consequence of the remaining fibres being stretched and forced by the action of muscle, which necessarily will contract more when some of its resistance is taken away. To obviate this mischief, it has been hitherto an indisputable maxim in surgery, to cut the tendon quite through, and immediately afterwards perform the suture. But this practice is not adviseable; for though the division of the tendon afford present ease, yet the mere flexion of the joint will have the same effect, if, for example, it be a wound of a flexor tendon: besides, in order to sew up the extremities of the tendon when divided, we are obliged to put the limb in such a situation, that they may be brought into contact, and even to sustain it in that posture to the finishing of the cure: if then, the posture will lay the tendon in this position, we can likewise keep it so without using the suture, and are more sure of its not slipping away, which sometimes happens from any careless motion of the joint, when the stitches have almost worn through the lips of the wound; on which account, it is by all means adviseable, in this case, to forbear the suture, and only to favour the situation of the extremities of the tendon, by placing the limb properly.

But when the tendon is quite separated, and the ends are withdrawn from one another, having brought them together with your fingers, you may sew them with a straight triangular pointed needle, passing it from without inwards, and from within outwards in small tendons; about three tenths of an inch from their extremities, and in the *tendo Achillis* half an inch.

As the wound of the skin will be nearly tranverse, it should not be raised to expose more of the tendon, but rather sewed up with it, which will conduce to the strength of the suture. The knot of the ligature is to be made as in other wounds, and the dressings are to be the same: there is a sort of thin crooked needle that cuts on its concave and convex sides, which is very handy in the suture of large tendons, and to be preferred to the straight one. During the cure, the dressings must be superficial, and the parts kept steady with pasteboard and bandage: the small tendons reunite in three weeks, but the *tendo Achillis* requires six at least.

Of the Gastroraphy.

This word signifies no more than sewing up any wound of the belly; yet in common acceptation, it implies that the wound of the belly is complicated with another of the intestine. Now the symptoms laid down for distinguishing when the intestine is wounded, do not with any certainty determine it to be wounded only in one place; which want of information makes it absurd to open the abdomen in order to come at it: if so, the operation of stitching the bowels can only take place where they fall out of the abdomen, and we can see where the wound is, or how many wounds there are: if it happens that the intestines fall out unwounded, the business of the surgeon is to return them immediately, without waiting for spirituous or emollient fomentations; and in case they puff up so as to prevent their reduction by the same orifice, you may with a knife or probe-sciffars sufficiently dilate it for that purpose, or even prick them to let out the wind.

Upon the supposition of the intestine being wounded in such a manner as to require the operation, (for in small punctures it is not necessary,) the method of doing it may be this: Taking a straight needle with a small thread, you lay hold of the bowel with your left hand, and sew up the wound by the glover's stitch, that is, by passing the needle through the lips of the wound, from within outwards all the way, so as to leave a length of thread at both ends, which are to hang out of the incision of the abdomen; then carefully making the interrupted suture of the external wound, you pull the bowel by the small threads into contact with the peritonæum, in order to procure an adhesion, and tie them upon a small bolster of linen. In about six days, it is said the ligature of the intestine will be loose enough to be cut and drawn away, which must be done without great force; in the interim, the wound is to be treated with superficial dressings, and the patient to be kept very still and low.

Of the Bubonocele.

When the intestine or omentum falls out of the abdomen into any part, the tumour in general is known by the name of *hernia*; which is farther specified either from the difference of situation, or the nature of its contents. When the intestine or omentum falls through the navel, it is called a *hernia umbilicalis*, or *exomphalos*; when through the rings of the abdominal muscles into the groin, *hernia inguinalis*; or if into the scrotum, *scrotalis*: these two last, though the first only is properly so called, are known by the name of bubonocele. When they fall under the *ligamentum Fallopii*, through the same passage that the iliac vessels creep into the thigh, it is called *hernia femoralis*. The bubonocele is also sometimes accompanied with a descent of the bladder: however, the case is very rare; but when it occurs, it is known by the patient's inability to urine, till the hernia of the bladder is reduced within the pelvis. With regard to the contents characterising the swelling, it is thus distinguished: if the intestine only is fallen, it becomes an *enterocele*; if the omentum, (*epiploön*) *epiplocele*; and if both, *entero-epiplocele*. There is, besides these, another kind of hernia mentioned and described by the moderns, when the intestine or omentum is insinuated between the interstices of the muscles, in different parts of the belly: this hernia has derived its name from the place affected, and is called the *hernia ventralis*; and lastly, there have been a few instances, where the intestines or omentum have fallen thro' the great foramen of the ischium into the internal part of the thigh, between and under the two anterior heads of the triceps muscle.

All the kinds of hernias of the intestines and omentum, are owing to a preternatural dilatation of the particular orifices through which they pass, and not to a laceration of them.

The rupture of the groin, or scrotum, is the most common species of hernia, and in young children is vere frequent; but it rarely happens in infancy, that any mischiefs arise from it. For the most part, the intestine returns of itself into the cavity of the abdomen, whenever the person lies down; at least a small degree of compression will make it. To secure the intestine when returned into its proper place, there are steel trusses now so artfully made, that by being accommodated exactly to the part, they perform the office of a bolster, without galling, or even sitting uneasy on the patient. These instruments are of so great service, that were

were people who are ſubject to ruptures always to wear them, very few would die of this diſtemper: ſince it often appears, upon inquiry, when we perform the operation for the bubonocele, that the neceſſity of the operation is owing to the neglect of wearing a truſs.

In the application of a truſs to theſe kinds of ſwellings, a great deal of judgment is ſometimes neceſſary, and for want of it, we daily ſee truſſes put even on buboes, indurated teſticles, hydroceles, *&c.*

If there is a rupture of the inteſtine only, it is eaſily, when returned into the abdomen, ſupported by an inſtrument: but if of the omentum, notwithſtanding it may be returned, yet the reduction ſeldom brings relief, unleſs there is only a ſmall quantity of it; for the omentum will lie uneaſy in a lump at the bottom of the belly, and, upon removal of the inſtrument, drop down again imediately; upon which account, ſeeing the little danger and pain there is in this kind of hernia, nothing need be uſed but a bag truſs, to ſuſpend the ſcrotum, and prevent poſſibly by that means the increaſe of the tumour. The difference of theſe tumours will be diſtinguiſhed by the feel; that of the omentum feeling flaccid and rumpled, the other more even, flatulent, and ſpringy.

Sometimes, in a rupture of both the inteſtine and omentum, the gut may be reduced, but the omentum will ſtill remain in the ſcrotum; and when thus circumſtanced, a ſteel-truſs muſt be uſed.

We have hitherto conſidered the rupture as moveable; but it happens frequently, that the inteſtine, after it has paſſed the rings of the muſcles, is preſently inflamed, which enlarging the tumour, prevents the return of it into the abdomen, and becoming every moment more and more ſtrangled, it ſoon tends to a mortification, unleſs we dilate the paſſages through which it is fallen, with ſome inſtrument, to make room for its return; which dilatation is the operation for the Bubonocele.

It rarely happens that patients ſubmit to this inciſion before the gut is mortified, and it is too late to do ſervice; not but that there are inſtances of people ſurviving ſmall gangrenes, and even perfectly recovering afterwards.

In mortifications of the bowels, when fallen out of the abdomen into the navel, it is not very uncommon for the whole gangrened inteſtine to ſeparate from the ſound one, ſo that the excrement muſt neceſſarily ever after be diſcharged at that orifice: there are likewiſe a few inſtances, where the rupture of the ſcrotum has mortified, and become the anus, the patient doing well in every other reſpect.

Before the performance of the operation for the bubonocele, which is only to be done in the extremity of danger, the milder methods are to be tried; theſe are, ſuch as will conduce to ſoothe the inflammation.

Perhaps except the pleuriſy, no diſorder is more immediately relieved by plentiful bleeding than this. Clyſters repeated, one after another, three or four times, if the firſt or ſecond are either retained too long, or immediately returned, prove very efficacious: theſe are ſerviceable, not only as they empty the great inteſtines of their excrements and flatulencies, which laſt are very dangerous, but they likewiſe prove a comfortable fomentation, by paſſing thro' the colon all around the abdomen. The ſcrotum and groin muſt, during the ſtay of the clyſter, be bathed with warm ſtoops wrung out of a fomentation; and after the part has been well fomented, you muſt attempt to reduce the rupture: for this purpoſe, let your patient be laid on his back, ſo that his buttocks may be conſiderably above his head; the bowels will then retire towards the diaphragm, and give way to thoſe which are to be puſhed in. If, after endeavouring two or three minutes, you do not find ſucceſs, you may ſtill repeat the trial.

If, notwithſtanding theſe means, the patient continues in very great torture, though not ſo bad as to threaten an immediate mortification, we muſt apply ſome ſome ſort of poultice to the ſcrotum; ſuch as equal parts of oil and vinegar made into a proper conſiſtence with oat-meal: after ſome few hours, the fomentation is to be repeated, and the other directions put in practice.

After all, ſhould the pain and tenſeneſs of the part continue, and hiccoughs and vomitings of the excrements ſucceed, the operation muſt take place; for if you wait until a languid pulſe, cold ſweats, ſubſiding of the tumour, and emphyſematous feel come on, it will be moſt likely too late, as they are pretty ſure ſymptoms of a mortification.

To conceive rightly of the occurrences in this operation, it muſt be remembered, that in every ſpecies of rupture, a portion of the *peritonæum* generally falls down with whatever makes the *hernia;* which, from the circumſtance of containing immediately the contents of the tumour, is called the *ſac* of the *hernia*. Now, the portion of the *peritonæum*, which uſually yields to the impulſion of the deſcending *viſcera*, is that which correſponds with the inmoſt opening of the abdominal muſcles, juſt where the *membrana cellularis peritonæi* begins to form the *tunica vaginalis* of the ſpermatic cord; ſo that the *ſac* with the *viſcera* inſinuate themſelves into the *tunica vaginalis* of the ſpermatic cord, and lie upon the *tunica vaginalis* of the teſticle: nevertheleſs, upon examination, the contents of the *hernia* are ſometimes in contact with the teſticle itſelf; that is to ſay, within the *tunica vaginalis* of the teſticle. For ſome months during geſtation, the *teſtes* of the *fœtus* remain in the *abdomen;* and when they deſcend into the *tunica vaginalis*, there is an immediate communication betwixt the cavity of the *abdomen*, and the cavity of the *tunica vaginalis*, which, in proceſs of time, becomes obliterated by the coalition of the *tunick*, with the cord; but if it happen, before the coalition be effected, that the inteſtine or the *omentum* fall into the *ſcrotum*, they will neceſſarily remain in contact with the *teſtes*.

From this deſcription of the deſcent of the *viſcera*, it is evident that the *herniary ſac* is contained within the *tunica vaginalis*, and ought to give the idea of one bag incloſing another: but in the operation, this diſtinction of coats does not always appear; for the *herniary ſac* ſometimes adheres ſo firmly to the *tunica vaginalis*, that together they make one thick coat: this adheſion may poſſibly reſult from the preſent inflammation of the parts, which has rendered the operation neceſſary.

The beſt way of laying your patient will be on a table about three feet four inches high, letting his legs hang down; then properly ſecuring him, you begin your inciſion above the rings of the muſcles, beyond the extremity of the tumour, and bring it down about half the length of the *ſcrotum*, through the *membrana adipoſa*, which will require very little trouble to ſeparate from the *tunica viginalis*, and conſequently will expoſe the rupture for the farther proceſſes of the operation. If a large veſſel is opened by the inciſion, it muſt be taken up before you proceed further.

When

When the *tunica vaginalis* is laid bare, you muſt cut carefully through it and the *peritonæum*, in order to avoid pricking the inteſtines.

The *peritonæum* being cut through, we arrive to its contents, the nature of which will determine the next proceſs: for if it is inteſtine only, it muſt directly be reduced, but if there is any mortified *omentum*, it muſt be cut off; in order to which it is adviſed to make a ligature above the part wounded, to prevent an hæmorrhage; but it is quite needleſs, and in ſome meaſure pernicious, as it puckers up the inteſtine, and diſorders its ſituation, if made cloſe to it.

When the *omentum* is removed, we next dilate the wound; to do which with ſafety, an infinite number of inſtruments have been invented: but there is none we can uſe in this caſe with ſo good management as a knife; and the finger in this operation is often a much better defence againſt pricking the bowels, than a director. The knife muſt be a little crooked and blunt at its extremity, like the end of a probe. Some ſurgeons perhaps may not be ſteady enough to cut dexterouſly with a knife, and may therefore perform the inciſion with probe-ſciſſars, carefully introducing one blade between the inteſtine and circumference of the rings, and dilating upwards, and a little obliquely outwards. When the finger and knife only are employed, the manner of doing the operation will be by preſſing the gut down with the fore-finger, and carrying the knife between it and the muſcles, ſo as to dilate upwards about an inch, which will be a wound generally large enough: but if, upon examination, it ſhall appear that the inteſtine is ſtrangulated within the *abdomen*, which may poſſibly happen from a contraction of the *peritonæum* near the entrance into the *ſac*; in that caſe, the inciſion muſt be continued through the length of the contracted channel, or the conſequence will be fatal, notwithſtanding the inteſtine be reſtored into the *ſcrotum*: on this account the operator ſhould paſs his finger up the *ſac* into the *abdomen*, after the reduction of the gut, in order to diſcover whether it be ſafely returned into its proper place.

The opening being made, the inteſtine is gradually to be puſhed into the *abdomen*, and the wound to be ſtitched up; for this purpoſe, ſome adviſe the quilled, and others the interrupted ſuture, to be paſſed through the ſkin and muſcles; but as there is not ſo much danger of the bowels falling out when a dreſſing and bandage are applied, and the patient all the while kept upon his back, but that it may be prevented by one or two ſlight ſtitches through the ſkin only, it is by all means adviſeable to follow this method, ſince the ſtricture of a ligature in theſe tendinous parts may be dangerous.

Hitherto, in the deſcription of the *bubonocele*, we have ſuppoſed the contents to be looſe, or ſeparate in the *ſac*: but it happens ſometimes in an operation, that we find not only an adheſion of the outſide of the *peritonæum* to the *tunica vaginalis*, and ſpermatic veſſel, but likewiſe of ſome part of the inteſtines to its internal ſurface; and in this caſe there is ſo much confuſion, that the operator is often obliged to extirpate the teſticle, in order to diſſect away and diſintangle the gut; though if it can be done without caſtration, it ought: however, this accident happens rarely, except in thoſe ruptures that have been a long time in the *ſcrotum* without returning: in which caſe the difficulty and hazard of the operation are ſo great, that, unleſs urged by the ſymptoms of an inflamed inteſtine, it ſhould not be undertaken.

The dreſſing of the wound firſt of all may be with dry lint, and afterwards as directed under the head of wounds.

The operation of the *bubonocele* in women ſo nearly reſembles that performed on men, that it requires no particular deſcription: only in them the rupture is formed by the inteſtine or *omentum* falling down through the paſſage of the *ligamentum rotundum* into the groin, or one of the *labia pudendi*; where cauſing the ſame ſymptoms, as when obſtructed in the *ſcrotum*, it is to be returned by the dilatation of that paſſage.

Of the Epiplocele.

There have been a few inſtances where ſo great a quantity of the *omentum* has fallen into the *ſcrotum*, that, by drawing the ſtomach and bowels downwards, it has excited vomitings, inflammation, and the ſame train of ſymptoms as happen in a *bubonocele*; in which caſe, the operation of opening of the *ſcrotum* is neceſſary: the inciſion muſt be made in the manner of that for the rupture of the inteſtine, and the ſame rules obſerved with regard to the *omentum* that are laid down in the laſt ſection. It is neceſſary alſo, the rings of the muſcles ſhould be dilated; or otherwiſe, though you have taken away ſome of the mortified part of the *omentum*, the reſt that is out of its place, and ſtrangled in the perforation, will gangrene alſo. The wound is to be treated in the ſame manner as that after the operation of the *bubonocele*.

Of the Hernia Femoralis.

This ſpecies of rupture is the ſame in both ſexes, and formed by the falling of the *omentum* or inteſtine, or both of them, into the inſide of the thigh, through the arch made by the *os pubis* and *ligamentum Fallopii*, where the iliac veſſels and tendons of the *pſoas* and *iliacus internus* muſcles paſs from the *abdomen*. It is very neceſſary ſurgeons ſhould be aware of the frequency of this diſorder, which creates the ſame ſymptoms as other ruptures, and muſt firſt of all be treated by the ſame methods: the manner of operating in the reduction is here too ſo exactly the ſame, with the difference of dilating the ligament inſtead of the rings of the muſcles, that it would be a mere repetition of the operation for the *bubonocele* to give any deſcription of it: only it may be obſerved, that the ſpermatic cord, as it enters into the *abdomen*, lies nearly tranſverſe to the inciſion, and cloſe in contact with the ligament; ſo that unleſs you make the dilatation obliquely outwards, inſtead of perpendicularly upwards, you will probably divide thoſe veſſels.

Of the Exomphalos.

This rupture is owing to a protruſion of the inteſtine, or *omentum*, or both of them, at the navel, and rarely happens to be the ſubject of an operation: for though the caſe is common, yet moſt of them are gradually formed from very ſmall beginnings; and if they do not return into the *abdomen* upon lying down, in all probability they adhere without any great inconvenience to the patient, till ſome time or other an inflammation falls upon the inteſtines, which ſoon brings on a mortification, and death; unleſs, by great chance, the mortified part ſeparates from the ſound one, leaving its extremity to perform the office of an *anus*: in this emergency, however, it is adviſeable to attempt the reduction, if called in at the beginning, though the univerſal adheſion of the *ſac* and its contents are a great obſtacle to the ſucceſs: the

the instance in which it is most likely to answer, is, when the rupture is owing to any strain, or sudden jerk, and is attended with these disorders which follow upon the strangulation of a gut.

In this case, having tried all other means in vain, the operation is absolutely necessary; which may be thus performed: Make the incision somewhat above the tumour, on the left side of the navel, through the *membrana adipofa*; and then emptying the sac of its water, or mortified omentum, dilate the ring with the same crooked knife, conducted on your finger, as in the operation for the bubonocele; after this, return the intestines and omentum into the abdomen, and dress the wound without making any ligature but of the skin only.

Of the Hernia Ventralis.

The *hernia ventralis*, which sometimes appears between the recti muscles, is very large; but that tumour which requires the operation is seldom bigger than a walnut, and is a disease not so common as to have been observed by many: but there are cases enough known, to put a surgeon upon inquiry after it. When the patient is suddenly taken with all the symptoms of a rupture, without any appearance of one in the navel, scrotum, or thigh, the manner of dilating it will be the same as that above directed in the other hernias; after the operation in this and all hernias where the intestines have been reduced, it will be convenient to wear a truss, since the cicatrix is not always firm enough in any of them to prevent a relapse.

Explanation of Fig. 2. Plate CLVII.

A, The round-edged knife, of a convenient size for almost all operations where a knife is used; the make of it will be better understood by the figure than any other description; only it may be remarked, that the handle is made of a light wood, as indeed the handles of all instruments should be, that the resistance to the blades may be better felt by the surgeon.

B, A pair of probe-sciffars, which require nothing very particular in their form, but that the lower blade should be made as small as possible, so that it is strong, and has a good edge; because, being chiefly used in fistulas *in ano*, the introduction of a thick blade into the sinus, which is generally narrow, would be very painful to the patient.

C, The crooked knife with the point blunted, used in the operation of the bubonocele.

Of the Hydrocele.

The *hydrocele*, called also *hernia aquosa*, *hydrops scroti*, and *hydrops testis*, is a watery tumour of the scrotum; which, notwithstanding the multiplicity of distinctions used by writers, is but of two kinds; the one when the water is contained in the *tunica vaginalis*, and the other when in the *membrana cellularis scroti*. This last is almost always complicated with an anasarca; which species of dropsy is an extravasation of water lodged in the cells of the *membrana adipofa*; and when thus circumstanced, will not be difficult to be distinguished; besides that it is sufficiently characterised by the shining and softness of the skin, which gives way to the least impression, and remains pitted for some time. The penis is likewise sometimes enormously enlarged, by the insinuation of the fluids into the *membrana cellularis*; all which symptoms are absolutely wanting in the dropsy of the *tunica vaginalis*.

In the dropsy of the *membrana cellularis scroti*, the puncture with the trocar is recommended by some, and little orifices made here and there with the point of a lancet by others; or a small skane of silk passed by a needle through the skin, and out again at the distance of two or three inches, to be kept in the manner of a seton, till the waters are quite drained: but the two first methods avail very little, as they open but few cells; and the last cannot be so efficacious in that respect as incisions, and will be much more apt to become troublesome, and even to gangrene.

Indeed it is not often proper to perform any operation at all upon this part, since the *membrana cellularis scroti*, being a continuation of the *membrana adipofa*, scarifications made through the skin in the small of the legs will effectually empty the scrotum: and this place ought rather to be pitched upon than the other, as being more likely to answer the purpose by reason of its dependency: however, it sometimes happens, that the waters fall in so great quantities into the scrotum, as, by distending it, to occasion great pain, and threaten a mortification: the prepuce of the penis also becomes very often excessively dilated, and so twisted, that the patient cannot void his urine. In these two instances, an incision of three inches long should be made on each side of the scrotum, quite through the skin into the cells containing the water, and two or three of half an inch long, in any part of the penis, with a lancet or knife; all which may be done with great safety, and sometimes with the success of carrying off the disease of the whole body.

The dropsy of the *tunica vaginalis* is owing to a preternatural discharge of that which is continually separating in a small quantity, on the internal surface of the tunick, for the moistening or lubricating the testicle, and which collecting too fast accumulates and forms in time a swelling of great magnitude: this is what we take to be the other species of hydrocele, and the only one besides.

The hydrocele of the *tunica vaginalis* is very easily to be distinguished from the hydrocele of the *membrana cellularis*, by the preceding description of that species of dropsy: We shall now explain how it differs from the other tumours of the scrotum, *viz.* the *bubonocele*, *epiplocele*, and enlarged testicle. In the first place, it is seldom or never attended with pain in the beginning, and is very rarely to be imputed to any accident, as the hernia's of the omentum and intestine are. From the time it first makes its appearance, it very seldom is known to appear or diminish; but generally continues to increase, though in some much faster than in others; in one person growing to a very painful distension in a few months, whilst in another it shall not be troublesome in many years; nay, shall cease to swell at a certain period, and ever after continue in that state without any notable disadvantage; though this last case very rarely happens. In proportion as it enlarges, it becomes more tense, and then is said to be transparent: indeed the trasparency is made the chief criterion of the distemper, it being constantly advised to hold a candle on one side of the scrotum, which it is said will shine through the the other, if there be water. But this experiment does not always answer, because sometimes the tunica vaginalis is very much thickneed, and sometimes the water itself is not trasparent: so that to judge positively if there be a fluid, we must be guided by feeling a fluctuation; and

and though we do not perhaps evidently perceive it, yet we may be persuaded there is a fluid of some kind, if we are once assured that the distension of the *tunica vaginalis* makes the tumour; which is to be distinguished in the following manner.

If the the intestine, or omentum, form the swelling, they will be soft and pliable, (unless inflamed;) uneven in their surface, particularly the omentum; and both of them extend themselves up from the scrotum quite into the very abdomen: whereas, in the hydrocele, the tumour is tense and smooth, and ceases before or at its arrival to the rings of the abdominal muscles; because the upper extremity of the *tunica vaginalis* terminates at some distance from the surface of the belly.

When the testicle is increased in its size, the tumour is rounder; and if not attended with an enlargement of the spermatic vessels, the cord may be easily distinguished between the swelling and abdomen; but without this rule of distinction, either the pain, or the very great hardness, will discover it to be a disease of the testicle.

As to the cure of this distemper by external applications, or internal means, little is to be expected; on which account, it is generally adviseable to wait with patience until the tumour becomes troublesome, and then to tap it with a lancet or trocar. In opening with a lancet, it may possibly happen, that the orifice of the skin shall slip away from that of the tunick, and prevent the egress of the water: to obviate which inconvenience, you may introduce a probe, and by that means secure the exact situation of the wound; but if the coats are very much thickened, it will be adviseable to use the trocar, rather than the lancet. It is spoken of as an easy thing, to hold the testicle with the left hand, while we make the puncture with the right; but when the *tunica vaginalis* is very tense, it cannot well be distinguished: however, there is no danger of wounding it, if you make the puncture in the inferior part of the scrotum. During the evacuation, the scrotum must be regularly pressed; and after the operation, a little piece of dry lint and sticking plaster are sufficient.

This method of tapping is called the palliative cure; not but that it does now and then prove an absolute one. To prevent the relapse of this disease, surgeons prescribe the making a large wound, either by incision or caustic, that upon healing it afterwards, the firmness and contraction of the cicatrix may bind up the relaxed lymphatic vessels, and obstruct the further preternatural effusion of their contents: but this practice is generally attended with so much trouble, that, notwithstanding its success in the end, most surgeons prefer the palliative.

Of Castration.

This is one of the most melancholy operations in the practice of surgery, since it seldom takes place but in disorders into which the patient is very apt to relapse, *viz.* those of a schirrhus, or cancer: for under most of the symptoms described as rendering it necessary, it is absolutely improper; such as a hydrocele, abscess of the testes, an increasing mortification, or what is sometimes understood by a sarcocele; of which last it may not be amiss to say a word. In the utmost latitude of the meaning of this term, it is received as a fleshy swelling of the testicle itself, called likewise *hernia carnosa*; or in some enlargements, such as in a clap, more frequently *hernia humoralis*; but generally speaking, is considered as a fleshy excrescence formed on the body of the testis, which becoming exceedingly hard and tumefied, for the most part is supposed to demand extirpation, either by cutting or burning away the induration, or amputating the testicle. But this maxim too precipitately received, has very much misguided the practitioners of surgery.

It sometimes happens that the epidydymis is tumefied, independent of the testicle; and feeling like a large adventitious excrescence, answers very well to the idea most surgeons form of a *sarcocele:* but not being aware of the different nature and texture of the epididymis, they have frequently confounded its disorders with those of the testicle itself, and equally recommended extirpation in the induration of one or the other. But all indurations of the glandular part of the testicle not tending to inflammation and abscess, generally, if not always, lead on to scirrhus and cancers; whereas those of the epididymis seldom or never do. It is true, in spite of internal or external means, these last often retain their hardness, and sometimes suppurate, but however without much danger in either case.

Before castration, it is laid down as a rule to inquire whether the patient has any pain in his back, and in that case to reject the operation, upon the reasonable presumption of the spermatic vessels being likewise diseased: but we are not to be too hasty in this determination; for the mere weight of the tumour stretching the cord, will sometimes create this complaint. To learn the cause then of this pain in the back, when the spermatic cord is not thickened, let your patient be kept in bed, and suspend his scrotum in a bag-truss, which will relieve him, if disordered by the weight only; but if the spermatic cord is thickened or indurated, which disease, when attended with a dilatation of the vessels of of the scrotum, is known by the Greek appellations *circocele* and *varicocele*, the case is desperate, and not to be undertaken.

But supposing no obstacle in the way to the operation, the method of doing it may be this: Lay your patient on a square table of about three feet four inches high, letting his legs hang down, which, as well as the rest of his body, must be held firm by the assistants. Then with a knife begin your wound above the rings of the abdominal muscles, that you may have room afterwards to tie the vessels, since for want of this caution operators will necessarily be embarrassed in making the ligature: then carrying it through the *membrana adiposa*, it must be continued downward, the length of it being in proportion to the size of the testicle. If it is very small, it may be dissected away without taking any part of the scrotum. If the testicle, for instance, weighs twenty ounces; having made one incision about five inches long, a little circularly, begin a second in the same point as the first, bringing it with an opposite sweep to meet the other in the inferior part, in such a manner as to cut out the shape of an oval whose smallest diameter shall be two inches: after this, dissect away the body of the tumour, with the piece of skin on it, from the scrotum; first taking up some of the blood-vessels, if the hæmorrhage is dangerous. Then pass a ligature round the cord, pretty near the abdomen, and if you have space between the ligature and testicle, a second about half an inch lower, to make the stoppage of blood still more secure. The ligatures may be tied with what is called the *surgeon's knot*, where the thread is passed through the ring twice. This done, cut off the testicle a little underneath the second ligature, and pass a needle from the skin at the lower part of the wound through the skin at the upper part, in such a manner as to envelope in some

ſome degree the ſound teſticle, which will greatly facilitate and quicken the cure; or if one ſtitch will not anſwer the purpoſe, you may repeat it in ſuch part of the wound where the ſkin on each ſide lies moſt looſe.

In large tumours, it is adviſeable to cut away great part of the ſkin; for beſides that the hæmorrhage will be much leſs in this caſe, and the operation greatly ſhortened, the ſkin by the great diſtenſion having been rendered very thin, will great part of it, if not taken away, ſphacelate, and the reſt be more prone to degenerate into a cancerous ulcer.

Of the Phymosis.

The *phymoſis* ſignifies no more than ſuch a ſtraitneſs of the prepuce, that the glans cannot be denuded; which if it becomes troubleſome, ſo as to prevent the egreſs of the urine, or conceal under it chancres, or foul ulcers, quite out of the reach of application, is to be cut open. It ſometimes happens, that children are born imperforate; in which caſe, a ſmall puncture, dreſſed afterwards with a tent, effects a cure. But this operation is chiefly practiſed in venereal caſes, in order to expoſe chancres either on the glans or withinſide the prepuce itſelf: and here, if the prepuce is not very callous and thick, a mere inciſion will anſwer; which may be made either with the ſciſſars, or by ſlipping a knife between the ſkin and glans to the very extremity, and cutting it up: the laſt method is more eaſy than that of the ſciſſars; but it is ſafer to make the wound on the ſide of the prepnce than upon the upper part, for ſometimes the great veſſels on the *dorſum penis* afford a terrible hæmorrhage; though the prepuce remains better ſhaped after an inciſion made in the upper part, and therefore is to be preferred by thoſe who underſtand how to take up the veſſels. In children it ſometimes happens that the prepuce becomes very much contracted; and in that caſe, it is accidentally ſubject to ſlight inflammations, which bring on ſome ſymptoms of the ſtone; but the diſorder is always removed by the cure of the phymoſis.

If the prepuce be very large and indurated, the opening alone will not ſuffice; and it is more adviſeable to take away the calloſity by circumciſion, which muſt be performed with a knife; and if the artery bleed much, it muſt be taken up with a ſmall needle and ligature.

Of the Paraphymosis.

The paraphymoſis is a diſeaſe of the penis, where the prepuce is fallen back from the glans, and cannot be brought forwards to cover it. There are many whoſe penis is naturally thus formed, but without any inconvenience; ſo that ſince the time of the Romans, (ſome of whom thought it indecent to have the glans bare,) it has not been uſual to perform any operation upon that account; but we read the ſeveral proceſſes of it deſcribed very particularly by Celſus, who does not ſpeak of it as an uncommon thing. Moſt of the inſtances of this diſtemper are owing to a venereal cauſe; but there are ſome where the prepuce is naturally very tight, which take their riſe from a ſudden retraction of it, and immediate inlargement of the glans preventing its return. Sometimes it happens that the ſurgeon ſucceeds in the reduction immediately, by compreſſing the extremity of the penis, at the time he is endeavouring to advance the prepuce; if he does not, let him keep it ſuſpended, and attempt again, after having fomented, and uſed ſome emollient applications: but if, from the contraction below the *corona glandis*, there is ſo great a ſtricture as to threaten a gangrene, or even, if the penis is much inlarged by water in the *membrana reticularis*, forming tumours called *cryſtallines*, three or four ſmall inciſions muſt be made with the point of a lancet, into the ſtricture and *cryſtallines*, according to the direction of the penis; which in the firſt caſe will ſet free the obſtruction, and in the other evacuate the water: the manner of dreſſing afterwards muſt be with fomentations, digeſtives, and the *theriaca Londinenſis* over the pledgits.

Of the Paracentesis.

This operation is an opening made into the abdomen, in order to empty any quantity of extravaſated water, collected in that ſpecies of dropſy called the *aſcites*; but as there is much more difficulty in learning when to perform than how to perform it, and indeed in ſome inſtances requires the niceſt judgment, we ſhall endeavour to ſpecify the diſtinctions which render the undertaking more or leſs proper.

There are but two kinds of dropſy: the *anaſarca*, called alſo *leucophlegmacy*, when the extravaſated water ſwims in the cells of the *membrana adipoſa*; and the *aſcites*, when the water poſſeſſes the cavity of the abdomen. In the firſt kind, the water is clear and limpid; but in the ſecond, a little groſſer, very often gelatinous and corrupted, and ſometimes even mixed with fleſhy concretions.

The operation of tapping is ſeldom the cure of the diſtemper: but dropſies, which are the conſequence of a mere impoveriſhment of the blood, are leſs likely to return than thoſe which are owing to any previous diſorder of the liver; and it is not uncommon for dropſies that follow agues, hæmorrhages, and diarrhœas, to do well; whereas in ſuch as are complicated with a ſcirrhous liver, there is hardly an example of a cure.

The water floating in the belly, is, by its fluctuation, to determine whether the operation be adviſeable; for if, by laying one hand on any part of the abdomen, you cannot feel an undulation from ſtriking on an oppoſite part with the other, it is to be preſumed there will be ſome obſtacle to the evacuation. It ſometimes happens, that a great quantity, or almoſt all the water, is contained in little bladders, adhering to the liver and the ſurface of the *peritonæum*, known by the name of *hydatids*; and the reſt of it in different ſized ones, from the degree of a *hydatid*, to the ſize of a globe holding half a pint or a pint of water. This is called the encyſted dropſy, and from the ſmallneſs of its cyſts makes the operation uſeleſs; but is not difficult to be diſtinguiſhed, becauſe there is not a fluctuation of the water, unleſs it is complicated with an extravaſation.

When the fluctuation is hardly perceptible, (except the teguments of the abdomen are very much thickened by an *anaſarca*,) in all probability the fluid is gelatinous.

There is another kind of dropſy, which for the moſt part forbids the operation, and is peculiar to women, being ſeated in the body of one or both ovaries. There is no example of this ſpecies but what may be known by the hardneſs and irregularity of the tumour of the abdomen, which is nearly uniform in the other caſes.

When the ovary is dropſical, the water is generally depoſited in a great number of cells formed in the body of it; which circumſtance makes the fluctuation inſenſible, and the perforation uſeleſs: though ſometimes there are only one or two

two cells; in which caſe, if the ovary is greatly magnified, the undulation will be readily felt, and the operation be adviſeable.

When the *aſcites* and *anaſarca* are complicated, it is ſeldom proper to perform the operation, ſince the water may be much more effectually evacuated by ſcarifications in the legs than by tapping.

Upon the ſuppoſition nothing forbids the extraction of the water, the manner of operating is this: Having placed the patient in a chair of a convenient height, let him join his hands ſo as to preſs upon his ſtomach; then dipping the trocar in oil, you ſtab it ſuddenly through the teguments, and, withdrawing the perforator, leave the waters to empty by the canula: the *abdomen* being, when filled, in the circumſtance of a bladder diſtended with a fluid, would make it indifferent where to wound; but the apprehenſion of hurting the liver, if it be much enlarged, has induced operators rather to chuſe the left ſide, and generally in that part which is about three inches obliquely below the navel: if the navel protuberates, you may make a ſmall puncture with a lancet through the ſkin, and the waters will be readily voided by that orifice, without any danger of a *hernia* ſucceeding: but it ſhould be carefully attended to, whether the protuberance is formed by the water or an *exomphalos*; in which latter caſe, the inteſtine would be wounded, and not without the greateſt danger. The ſurgeon neither in opening with the lancet, nor perforating with the trocar, need fear injuring the inteſtines, unleſs there is but little water in the *abdomen*, ſince they are too much confined by the meſentery to come within reach of danger from theſe inſtruments; but it ſometimes happens that when the water is almoſt all emptied, it is ſuddenly ſtopped by the inteſtine or *omentum* preſſing againſt the end of the canula; in which caſe you may puſh them away with a probe: during the evacuation, your aſſiſtants muſt keep preſſing on each ſide of the *abdomen*, with a force equal to that of the waters before contained there; for by neglecting this rule, the patient will be apt to fall into faintings, from the weight on the great veſſels of the *abdomen* being taken off and the ſinking of the diaphragm ſucceeding; in conſequence of which, more blood flowing into the inferior veſſels than uſual, leaves the ſuperior ones of a ſudden too empty, and thus interrupts the regular progreſs of the circulation. To obviate this inconvenience, the compreſſion muſt not only be made with the hands during the operation, but be afterwards continued, by ſwathing the *abdomen* with a roller of flannel, about eight yards long, and five inches broad, beginning at the bottom of the belly, ſo that the inteſtines may be borne up againſt the diaphragm: you may change the roller every day till the third or fourth day, by which time the ſeveral parts will have acquired their due tone. For the dreſſing a piece of dry lint and plaiſter ſuffice; but between the ſkin and roller it may be proper to lay a double flannel a foot ſquare, dipt in brandy or ſpirits of wine.

This operation, though it does not often abſolutely cure, yet it ſometimes preſerves life a great many years, and even a pleaſant one, eſpecially if the waters have been long collecting.

Explanation of Fig. 3. Plate CLVII.

A, A trocar of the moſt convenient ſize for emptying the *abdomen* when the water is not gelatinous. It is here repreſented with the perforator in the canula, juſt as it is placed when we perform the operation.

B, The canula of a large trocar, recommended in caſes where the water is gelatinous.

C, The perforator of the large trocar.

The handle of the trocar is generally made of wood, the canula of ſilver, and the perforator of ſteel. Great care ſhould be taken by the makers of this inſtrument, that the perforator ſhould exactly fill up the cavity of the canula; for, unleſs the extremity of the canula lies quite cloſe and ſmooth on the perforator, the introduction of it into the *abdomen* will be very painful. To make it ſlip in more eaſily, the edge of the extremity of the canula ſhould be thin and ſharp; and that the canula ſhould be of ſteel; for the ſilver one being of too ſoft a metal, becomes jagged or bruiſed at its extremity with very little uſe.

Of the Fistula in Ano.

The *fiſtula in ano* is an abſceſs running upon or into the *inteſtinum rectum*.

The piles, which are little tumours formed about the verge of the *anus*, immediately within the *membrana interna* of the *rectum*, do ſometimes ſuppurate, and become the fore-runners of a large abſceſs; alſo external injuries here, as in every other part of the body, may produce it; but from whatever cauſe the abſceſs ariſe, the manner of operating upon it will be according to the nature and direction of its cavity.

If the ſurgeon have the firſt management of the abſceſs, and there appear an external inflammation upon one ſide of the buttock only; after having waited for the proper maturity, let him with a knife make an inciſion the whole length of it; and in all probability, even though the bladder be affected, the largeneſs of the wound, and the proper application of doſſils lightly preſſed in, will prevent the putrefaction of the inteſtine, and make the cavity fill up, like impoſthumations of other parts.

If the *ſinus* be continued to the other buttock, almoſt ſurrounding the inteſtine, the whole courſe of it muſt be dilated in like manner; ſince, in ſuch ſpungy cavities, a generation of fleſh cannot be procured but by large openings; whence alſo, if the ſkin is very thin, lying looſe and flabby over the *ſinus*, it is abſolutely neceſſary to cut it quite away, or the patient will be apt to ſink under the diſcharge, which, in the circumſtance here deſcribed, is ſometimes exceſſive. By this method, which cannot be too much recommended, it is amazing how happy the event is likely to be; whereas, from neglecting it, and truſting only to a narrow opening, if the diſcharge do not deſtroy the patient, at leaſt the matter, by being confined, corrupts the gut, and inſinuating itſelf about it, forms many other channels, which running in various directions often baffle an operator, and have been the cauſe of a fiſtula being ſo generally eſteemed very difficult of cure.

Here we have conſidered the impoſthumation as poſſeſſing a great part of the buttock; but it more frequently happens, that the matter points with a ſmall extent of inflammation on the ſkin, and the direction of the *ſinus* is even with the gut: in this caſe, having made a puncture, you may with a probe learn if it has penetrated into the inteſtine, by paſſing your finger up it, and feeling the probe introduced through the wound into its cavity; though, for the moſt part, it may be

be known by a difcharge of matter from the *anus*. When this is the ftate of the fiftula, there is no hefitation to be made; but immediately putting one blade of the fciffars up the gut, and the other up the wound, fnip the whole length of it. This procefs is as advifeable when the inteftine is not perforated, if the *finus* is narrow, and runs upon or very near it; for if the abfcefs be tented, which is the only way of dreffing it while the external orifice is fmall, it will almoft certainly grow callous; fo that the fureft means of cure, will be opening the gut, that proper applications may be laid to the bottom of the wound. However, it fhould be well attended to, that fome *finufes* pretty near the inteftine neither run into nor upon it; in which cafe, they muft be opened, according to the courfe of their penetration. There are abundance of inftances, where the inteftine is fo much ulcerated, as to give free iffue to the matter of the abfcefs by the *anus*: but there are none where there is not, by the thinnefs and difcolouration of the fkin, or an induration to be perceived through the fkin, fome mark of its direction; which, if difcovered, may be opened into with a lancet, and then it becomes the fame cafe as if the matter had fairly pointed.

If the *finufes* into and about the gut are not complicated with an induration, and you can follow their courfe; the mere opening with fciffars, or a knife guided on a director, will fometimes fuffice; but it is generally fafer to cut the piece of flefh furrounded by thefe incifions quite away, and, when it is callous, abfolutely neceffary, or the callofities muft be wafted afterwards by efcharotick medicines, which is a tedious and cruel method of cure.

When the fiftula is of a long ftanding, and we have choice of time for opening it, a dofe of rhubarb the day before the operation will be very convenient, as it not only will empty the bowels, but alfo prove an aftringent for a while, and prevent the mifchief of removing the dreffings in order to go to ftool.

It fometimes happens, that the orifices are fo fmall, as not to admit the entrance of the fciffars; in which cafe, fponge tents muft be employed for their dilatation.

In performing thefe operations on the *anus*, no inftruments are fo handy as the knife and fciffars; almoft all the others which have been invented to facilitate the work are not only difficult to manage, but more painful to the patient: however, in thofe inftances where the fiftula is very narrow, and opens into the inteftines, juft within the verge of the *anus*, the fyringotomy may be ufed with advantage; but where the opening into the gut is high, it cannot be employed without giving great pain.

The worft fpecies of fiftula is that communicating with the *urethra*, and fometimes (through the proftate gland) with the bladder itfelf. This generally takes it rife from a former gonorrhœa, and appears externally firft in *pærineo*, and afterwards increafing more towards the *anus*, and even fometimes into the groin, burfts out in various orifices, through the fkin, which foon becomes callous and rotten; and the urine paffing partly through thefe orifices, will often excite as much pain, and of the fame kind, as a ftone in the bladder.

This fpecies of fiftula taking its rife from ftrictures of the urethra, is only manageable by the bougie: for fo long as the *urethra* is obftructed, the cure of the fiftula will be imperfect; but if the canal be opened by this application, it is amazing what obftinate indurations and foul *finufes* will in confequence difappear; though there are fome fo callous and rotten, as to demand the knife and fkilful dreffings, notwithftanding the *urethra* fhould be dilated by the ufe of bougies.

Of the Puncture *of the* Pærineum.

This operation is performed, when the bladder is under fuch a fuppreffion of urine, as cannot be relieved by any gentler methods, nor, by reafon of the obftruction in its neck or the *urethra*, will admit of the introduction of a catheter. The manner of doing it, as defcribed by moft writers, is by pufhing a common trocar from the place where the external wound in the old way of cutting is made, into the cavity of the bladder, and fo procuring the iffue of the water through the canula; but others, refining upon this practice, have ordered an incifion to be carried on from the fame part into the bladder, and then to infinuate the canula: but both the methods are to be rejected, in favour of an opening a little above the *os pubis*: for befides that it is not eafy to guide the inftrument through the proftate gland into the bladder, the neceffity of continuing it, in a part already very much inflamed and thickened, feldom fails to do mifchief, and even to produce a mortification.

There is another method ftill more eafy both to the patient and the operator; which confifts only in emptying the bladder with a common trocar, and ftopping the canula with a little cork, which is afterwards to be taken out as often as the patient has occafion to urine. The canula is to be continued in the bladder, till fuch time as the perfon finds he can void his urine by the natural paffage.

In this operation the *abdomen* ought to be perforated about two inches above the *os pubis*; and if the patient be fat, the trocar fhould penetrate two inches, otherwife an inch and a half will be fufficient.

Of the Stone.

Stony concretions are a difeafe incident to feveral parts of the body; but we fhall treat only of thofe formed in the kidneys and bladder.

Small ftones and gravel are frequently voided without pain; but fometimes they collect and become very large in the kidneys; in which cafe, a fit of the ftone in that part is the cure, from the inflammation and pain occafioning convulfive twitches, which at laft expel them. But in this difeafe the patient is very much relieved by feveral kinds of remedies, fuch as the mucilaginous, the faponaceous, *&c.* fome of which lubricate, and others both lubricate and ftimulate. The fand, in paffing through the *ureters*, is very much forwarded by the force of the urine. The *ureters* being very narrow as they run over the *pfoas* mufcle, and alfo at their entrance into the bladder, make the movement of the ftone very painful and difficult in thofe parts; but there is feldom fo much trouble after the firft fit; for when once they have been dilated, they generally continue fo. For the fymptoms of a ftone in the bladder, fee Medicine, p. 122.

Of Searching.

The patient being laid on a horizontal table, with his thighs elevated and a little extended, pafs the found with the concave part towards you, until it meets with fome refiftance *in perinæo*, a little above the anus; then turning it without much force, pufh it gently on into the bladder; and

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if it meets with an obstruction at the neck, raise its extremity upwards, by inclining the handle of it towards you; or if it don't then slip in, withdraw it a quarter of an inch, and introducing your fore-finger into the *rectum*, lift it up, and it will seldom fail to enter: there is some art in turning the sound in the proper place of the *urethra*, which surgeons not versed in this operation cannot so well execute; therefore they may pass the instrument with the concave side always towards the *abdomen* of the patient, observing the same rule at the entrance into the bladder as in the other method. The cause of this obstacle, besides the *rugæ* of the *urethra*, and the resistance of the *verumontanum*, is sometimes a small projection of the orifice of the bladder, in the *urethra*, like that of the *os tincæ* in the *vagina*, which occasions the end of the sound to slip a little beyond it.

Though, upon searching, we are assured of a stone in the bladder, we are not, without further inquiry, to operate immediately; since there are sometimes obstacles which forbid the operation, either absolutely, or only for a certain time; among these, that of greatest consequence, is the gravel or stone in the kidneys. The objections of less weight, and which frequently are removed, are a fit of the stone, a cough, a hectic, and being emaciated by long pain; excessive hot or cold weather are likewise hindrances: But in extremity of danger, these last considerations may be disregarded.

Difference of age makes an extreme difference of danger, infants and young people almost always recovering; but still the operation is adviseable on those advanced in years, tho' it is not attended with near the same success. This operation is performed four several ways, all which we shall describe.

Of the Lesser Apparatus, *or Cutting on the* Gripe.

The most ancient way of cutting for the stone, is that described by *Celsus*, and known by the name of *cutting on the gripe;* though, since the time of *Johannes de Romanis*, it is also called *cutting with the lesser apparatus*, to distinguish it from his new method, which, on account of the many instruments employed in it, is called *cutting with the greater apparatus*. The manner of doing the operation is this: You first introduce the fore finger and middle finger of the left hand, dipt in oil, up the *anus*, and pressing softly with your right hand above the *os pubis*, endeavour to bring the stone towards the neck of the bladder; then making an incision, on the left side of the *perinæum*, above the *anus*, directly upon the stone, you turn it out through the wound, either with your fingers or a scoop.

This way of cutting was attended with many difficulties, for want of proper instruments to direct the incision, and extract the stone, when it lay beyond the reach of the fingers, which in a large bladder was frequently the case.

The wound of the bladder in this operation is made in the same place as is now practised in the lateral method; but it being impracticable on some subjects, and uncertain on all others, has made it universally exploded.

Of the Greater Apparatus, *or the* Old way.

This method of cutting, invented by *Johannes de Romanis*, has at different times, and with different people, varied considerably in some of its processes, and particularly with regard to the use of certain instruments. What we shall describe, will be the manner in which it is now practised with all its improvements.

Having laid the patient on a square horizontal table, three feet four inches high, with a pillow under his head, let his legs and thighs be bent, and his heels made to approach his buttocks, by tying his hands to the bottom of his feet, with a couple of strong ligatures, about two yards long; and to secure him more effectually from struggling, pass a double ligature under one of his hams, and carry the four strings round his neck to the other ham; then passing the loop underneath it, make a knot by threading one of the single ends through the loop: After this, the thighs being widened from each other, and firmly supported by proper persons, you introduce the staff, having first dipt it in oil, which must be held by your assistant, a little leaning on the left side of the seam in *perinæo*; and beginning the external wound just below the *scrotum*, (which must be held out of the way,) you continue it downwards, to within two fingers breadth of the *anus*; then leaving that direction, you slip the knife forwards in the groove, pretty far into the bulbous part of the *urethra*; or, as there is some danger of wounding the *rectum*, in the continuation of the incision, you may turn the knife with the back towards it, and make this part of the incision from within outwards. Should a very large vessel be cut, it will be adviseable to tie it before you proceed any farther in the operation. When the wound is made, slide the gorget along the groove of the staff into the bladder; and to do it with more safety, when the beak of it is received in the groove, it will be proper to take the staff yourself in your hand: for if the assistant should, unwarily, either incline the handle of it too much towards you, or not resist enough to the force of the gorget, it is very apt to slip out of the groove, between the *rectum* and the bladder; which accident is not only inconvenient to the operator for the present, but is attended for the most part with very bad consequences. The gorget being passed, dilate the *urethra* and neck of the bladder with your fore-finger, and introduce the forceps into the bladder, keeping them shut till you touch the stone, when you must grasp it with a moderate force, and extract it by pulling downwards towards the *rectum*. Should you find a difficulty in laying hold of the stone, be careful to keep your forceps in such a position, that they may open upwards and downwards, (not laterally,) which will very much facilitate the embracing of the stone, in case it should happen to be thin and flat.

Of the High Operation.

This method of cutting for the stone was first published in the year 1561, by *Pierre Franco*. About the year 1719, it was first done in *England* by Mr *Douglas*, and after him practised by others. The manner of performing it, with the improvements made since *Franco*'s operation, is this:

The patient being laid on a square table, with his legs hanging over, and fastened to the sides of it by a ligature passed above the knee; his head and body lifted up a little by pillows, so as to relax the abdominal muscles; and his hands held steady by some assistants; inject through a catheter into the bladder as much barley-water as he can bear, which in a man is often about eight ounces, and sometimes, twelve. For the more easily doing this, an ox's *ureter* may be tied to the extremity of the syringe, and handle of the catheter,

catheter, which being pliable will prevent any painful motion of the instrument in the bladder.

The bladder being filled, an assistant, in order to prevent the reflux of the water, must grasp the *penis* the moment the catheter is withdrawn, holding it on one side, in such a manner as not to stretch the skin of the *abdomen;* then with a round edged knife make an incision about four inches long, between the *recti* and pyramidal muscles, through the *membrana adiposa*, as deep as the bladder, bringing its extremity almost down to the *penis*; after this, taking a crooked knife, continue the incision into the bladder, carrying it a little under the *os pubis*, and immediately upon the water's flowing out, introduce the fore-finger of your left hand, which will direct the forceps to the stone.

This method was at first received with great applause in London; but after some trial was rejected, for the following inconveniences.

It sometimes happens that the bladder, notwithstanding the injection, still continues so deep under the *os pubis*, that the *peritonæum* being necessarily wounded first, the intestines push out immediately at the orifice, and the urine afterwards empties into the *abdomen*; in which case, hardly any recover. The injection itself is exceedingly painful; and however slowly the fluid be injected, it distends the bladder so much more suddenly than the urine from the kidneys does, and so much faster than it can well bear, that it not only is seldom dilated enough to make the operation absolutely secure, but is sometimes even burst, or at least its tone destroyed by the hasty dilatation. What adds to the danger here, is the possibility of meeting with a contracted indurated bladder; which is a circumstance sometimes attending on the stone, and indeed an exceedingly dangerous one in all the other methods; but would be frightful in this, by reason not only of the necessity of wounding the *peritonæum*, but of the difficulty of coming at the stone. If the stone be very small, it is hard to lay hold of it with the forceps, and in a fat man the fingers are not long enough for that purpose. If there are many little stones, it will scarce happen that more than one at a time can be extracted; and if the stone breaks, it not only is impracticable to take it all away in the operation, but also, from the supine posture of the patient, it will generally remain in the bladder; whereas, in the other methods, for the most part, it works itself out with the urine. But even supposing that the operation itself is prosperous, the consequences generally are very troublesome; for the urine issuing out at an orifice where there is no descent, spreads itself upon the *abdomen*, and makes very painful excoriations; though, what is still worse, it sometimes insinuates itself into the cells between the bladder and *abdominal* muscles, and, together with the inflammation excited by the operation, brings on a suppuration there, which is always difficult to manage, and frequently mortal.

Of the LATERAL OPERATION.

THIS method was invented by an ecclesiastic, who called himself *Frere Jaques*. He came to Paris in the year 1697, bringing with him an abundance of certificates of his dexterity in opening; and making his history known to the court, and magistrates of the city, he got an order to cut at the *Hotel Dieu*, and the *Charité*, where he performed this operation on about fifty persons. His success did not answer the promises he had made.

The principal defect in his manner of cutting was the want of a groove in his staff: which made it difficult to carry the knife exactly into the bladder; nor did he take any care of his patients after the operation; so that for want of proper dressings, some of the wounds proved fistulous, and other ill consequences ensued.

Cheselden, improving Frere Jacquer's method, made use of the following, which is now the practice of most operators.

The patient being laid on a table, with his hands and feet tied, and the staff passed as in the old way, let your assistant hold it a little slanting on one side, so that the direction of it may run exactly through the middle of the left *erector penis* and *accelerator urinæ* muscles; then make your incision through the skin and fat, very large, beginning on one side of the seam in *perinæo*, a little above the place wounded in the old way, and finishing a little below the anus, between it and the tuberosity of the ischium: this wound must be carried on deeper between the muscles, until the prostate be felt; when, searching for the staff, and fixing it properly, if it has slipt, you must turn the edge of the knife upwards, and cut the whole length of that gland from within outwards, at the same time pushing down the rectum with a finger or two of the left hand; by which precautions the gut will alway escape wounding; after which, the operation finishes nearly in the same manner as with the greater apparatus.

If, upon introducing the forceps, you do not perceive the stone readily, you must lift up their handle, and feel almost perpendicularly for it; since for the most part, when it is hard to come at, it lies in one of the sinuses sometimes formed on each side of the neck of the bladder, which project forward in such a manner, that if the stone lie there, the forceps pass beyond it the moment they are through the wound; so that it would be impossible to lay hold of it, or even to feel it, if not aware of this circumstance.

When the stone breaks, it is much safer to take away the fragments with the forceps, than to leave them be discharged with the urine; and if the pieces are very small, like sand, a scoop is the best instrument; though some prefer the injecting barley-water into the bladder, which suddenly returning, brings away the broken particles of the stone.

As there are hardly any instances of more stones than one, when the stone taken away is rough; so when it is smooth and polished in any part of it, it is almost a certain sign of others behind; on which account, an operator should be careful, in that case, to examine not only with his fingers, but some convenient instrument, for the remaining ones; though indeed, in all cases, it may be proper to examine the bladder after the extraction of a stone; because it is possible there may be a second stone, notwithstanding the first be rough.

The great inconvenience of the lateral operation is the hæmorrhage which sometimes ensues in men; for in children the danger of it is not worth mentioning.

If in the operation any very large vessel of the external wound should be divided, it is adviseable to tie it before the extraction of the stone; but the necessity of doing this, does not occur once in twenty times.

There is but one objection more of any consequence, which is the danger of wounding the rectum; and this is a very troublesome accident: But if the operator observes the rule laid down with regard to that article, it might always be avoided.

In

In this method the remarkable parts wounded by the knife are, the *musculus transversalis penis, levator ani,* and *prostate gland:* In the old way, the urethra only is wounded, about two inches on this side the prostate, and the instruments are forced through the rest of the passage, which is composed of the bulbous part of the urethra, the membranous part of the urethra, the neck of the bladder, and prostate gland. This channel is so very narrow, that, till it be torn to pieces, the management of the forceps is exceedingly difficult; and it happens frequently, that from the tender texture of the membranous parts, the forceps are unwarily pushed through it between the *os pubis* and bladder; besides that in introducing the gorget upon the staff, it is apt to slip downwards between the rectum and bladder, both which inconveniencies are avoided in the lateral operation. It is true, the wound made in the lateral method will not admit of the extraction of a large stone without laceration as well as in the old way: but in the one case, the laceration is small, and made after a preparation for it by an incision; and in the other, all the parts are torn without any previous opening, and which are so very tight, that the pain of the distension must necessarily be excessive. However, in both these operations, the surgeon must not grasp the stone with violence; and even in extracting, must, with both hands to the branches of his forceps, resist their shutting so tight, as the compression from the lips of such a narrow wound would otherwise make them. The extraction of very large stones is much more impracticable with the greater apparatus than by this method, because of the smallness of the angle of the bones in that part where the wound is made; so that indeed it is necessary in almost all extractions to pull the stone downward towards the rectum, which cannot be done without great violence to the membranous parts, and even the separation of one from another; whence follow abscesses and sloughs about the wound, which is a circumstance not known in the lateral operation. *Ecchymoses* followed by suppuration and gangrene, sometimes spread themselves upon the scrotum; and in short, all the inconveniences and ill symptoms which attend upon the lateral operation, except the hæmorrhage, are in a more violent degree incident to the old way.

An incontinence of urine is not common after the lateral operation, and a fistula seldom or never the consequence of it.

The manner of treating the patient after the operation, is pretty nearly this: If it happens that the vessels of the prostate bleed, dry lint, or lint dipped in some styptick water, such as *aqua vitrioli*, must be applied to the part, and held there with a considerable degree of pressure for a few hours; or a silver canula of three or four inches long, covered with fine rag, may be introduced into the bladder, and left there two or three days, which seldom fails to stop the hæmorrhage. The patient may also take an opiate. If the wound does not bleed, a little dry lint, or a pledgit of digestive, laid gently in it, is best. The place where the patient lies, should be moderately cool, as heat not only disposes the vessels to bleed afresh, but generally makes him low and faint. If, soon after the operation, he complains of a sickness at the stomach, or even a pain in that part of the abdomen near the bladder, it is not always a sign of a dangerous inflammation, but frequently goes off in half an hour: to assist, however, in its removal, a fomentation put into an hog's bladder, and applied pretty warm to the part in pain, will be of great service: if the pain increases, after two or three hours, the consequence is much to be feared; and in this case, bleeding, and emollient clysters by way of fomentation to the bowels, are immediately necessary.

The first good symptom after the operation is the urine coming freely away, as we then know the lips of the bladder and prostate gland are not much inflamed. If the patient should become languid, and continue without any appetite, blisters prove beneficial; which may be applied with great safety, and little pain, as there is seldom or never any strangury. About the third or fourth day a stool must be procured by a clyster; for it seldom comes naturally the first time, and this method must be continued as every man's discretion shall guide him. As soon as the patient comes to an appetite, he should be indulged in eating light food; with this caution, that he do not eat too much at a time.

If, during the cure, the buttocks should be excoriated by the urine, let them be anointed with nutritum: the dressing from first to last is seldom any other than a soft digestive, or dry lint.

Of the Stone *in the* Urethra.

If a small stone be lodged in the urethra near the glans, it may often be pushed out with the fingers, or picked away with some instrument; but if it stops in any other part of the channel, it may be cut upon without any inconvenience. The best way of doing it, is to pull the prepuce over the glans, as far as you can; and then making an incision the length of the stone, through the teguments, it may be turned out with a little hook or the point of a probe: The wound of the skin slipping back afterwards, to its proper situation, and from the orifice of the urethra, prevents the issue of the urine through that orifice, and very often heals in twenty-four hours. This is a much less painful method of extracting stones from the urethra, than by any instruments that have hitherto been devised.

Of the extraction of the Stone *in* Women.

The extraction of the stone in women, will easily be understood, since the whole operation consists in placing them in the same manner as men, and, without making any wound, introducing into the bladder a straight director, upon that a gorget, and afterwards the forceps to take hold of the stone; all which may be done without difficulty, by reason of the shortness of the urethra. If the stone proves very large, and in extracting draws the bladder forwards, it is adviseable to make an incision through the neck of it, upon the stone; which not only will facilitate the extraction, but also be less dangerous than a laceration which will necessarily follow. The dressings are fomentations and emollient ointments, which should be applied two or three times a-day, and the patient in other respects be treated like men who have undergone the operation for the stone.

Explanation of Fig 4. Plate CLVII.

A, A sound used in searching for the stone.

The size represented here is but a little too large for the youngest children, and may be used upon boys till they are thirteen or fourteen years of age; a larger should be employed between that age and adultness, when one of about ten inches, in a right-line from the handle to the extremity, is proper. This should be made of steel, and its extremity be round and smooth.

B,

B, A ſtaff fit for the operation on boys from eight to fourteen years of age. The ſtaff for a man muſt be of the ſize of the ſound already deſcribed.

C, A ſtaff ſomething too big for the ſmalleſt children, but may be uſed upon boys from about four years of age to eight.

The ſtaff has a groove on its convex ſide, which firſt ſerves as a direction where to cut, and afterwards receiving the beak of the gorget, guides it readily to the bladder. Care ſhould be taken, in making the groove, that the edges of it be ſmoothed down, ſo that they cannot wound in paſſing through the urethra. The extremity ſhould alſo be open; otherwiſe it will be ſometimes difficult to withdraw the ſtaff, when the gorget is introduced, and preſſes againſt the end of it.

Theſe inſtruments are uſually made with a greater bending than here repreſented; but this ſhape is more like to that of the urethra, and rather more advantageous for making the inciſion.

D, the yoke, an inſtrument to be worn by men with an incontinence of urine. It is made with iron, but for uſe muſt be covered with velvet. It moves upon a joint at one end, and is faſtened at the other by catches at different diſtances placed on a ſpring. It muſt be accommodated to the ſize of the penis, and be taken off whenever the patient finds an inclination to make water. This inſtrument is exceedingly uſeful, becauſe it always anſwers the purpoſe, and ſeldom galls the part after a few days wearing.

Explanation of Fig. 5. Plate CLVII.

A, A ſmall catheter made of ſilver. This inſtrument is hollow, and ſerves to draw off the urine when under a ſuppreſſion. It is alſo uſed in the high operation to fill the bladder with water. Near its extremity, are two orifices, through which the water paſſes into its cavity. Care ſhould be taken that the edges of theſe orifices are quite ſmooth.

B, The knife uſed in cutting for the ſtone: it is the ſame already deſcribed; but it is not improper to repeat the figure with the alteration of a quantity of tow twiſted round it, which makes it eaſier to hold, when we perform the lateral operation, and turn the edge upwards to wound the proſtate gland.

C, A female catheter, differing from the male catheter, it being almoſt ſtraight; and ſomething larger.

D, A ſilver-wire to paſs into either catheter, for the removing any grumous blood or matter that clogs them up.

Explanation of Fig. 6. Plate CLVII.

A, The gorget uſed upon men in the lateral operation.

B, The gorget uſed upon children under five years of age in the lateral operation.

A gorget between the ſizes of theſe two will be fit for boys from five years of age to fifteen or ſixteen.

Theſe inſtruments are hollow for the paſſage of the forceps into the bladder; and their handles lie ſlanting, that they may the more readily be carrried through the wound of the proſtate, which is made obliquely on the left-ſide of it. The beak at the extremity of the gorget muſt be ſmaller than the groove of the ſtaff which is cut upon, becauſe it is to be received in the groove. Care ſhould be taken, that the edges of the gorget near the beak are not ſharp, leaſt, inſtead of dilating the wound, as it ought, it ſhould only cut on each ſide when introduced; in which caſe, it would be difficult to carry the forceps into the bladder.

C, A gorget, with its handle exactly in the middle; this ſhaped inſtrument is uſed in the old way. All the gorgets ſhould be made of ſteel.

Explanation of Fig. 7. Plate CLVII.

A, The forceps for extracting the ſtone. Theſe are repreſented a little open, that the teeth may be better ſeen within-ſide.

This inſtrument muſt be of different ſizes for different ages and ſtones, from the length of four inches to one of near a foot long; but the forceps of about eight inches long will be found moſt generally uſeful. The number neceſſary to be furniſhed with, will be four or five.

Great care ſhould be taken by the makers of this inſtrument, that it move eaſily upon the rivet; that the extremity of the chops do not meet when they are ſhut; and particularly that the teeth be not too large, leſt, in entering deep into the ſtone, they ſhould break it. It is of conſequence alſo that the teeth do not reach farther towards the joint than here repreſented, becauſe a ſmall ſtone, when received into that part, being held faſt there, would dilate the forceps exceſſively, and make the extraction difficult; on which account, the inſide of the blades near the joint ſhould be ſmooth, that the ſtone may ſlip towards the teeth.

B, A director made of ſteel, uſed for the direction of the gorget, in the extraction of the ſtone from women.

C, A ſcoop to take away the ſtone when it is broken into ſmall pieces like ſand. This inſtrument is made of ſteel.

Of the Empyema.

The operation for the empyema generally implies an artificial opening made into the cavity of the thorax, by which we evacuate any fluid that lies there extravaſated, and is become dangerous by its weight and quantity. The fluids deſcribed as neceſſary to be voided by this operation, are blood, matter, and water.

When blood is the fluid, ſuppoſed to require evacuation by this method, it is always extravaſated through ſome wound of the veſſels of the lungs or thorax, and being diſcharged in great quantities on the diaphragm, is ſaid to oppreſs reſpiration, till let out by ſome convenient opening made in the moſt depending part of that cavity, which is the only kind of perforation into the thorax diſtinguiſhed by the name of the operation for the *empyema:* But though this opening is univerſally recommended in the caſe here ſtated, yet we meet with few or no examples where it has been practiſed for a mere extravaſation of blood.

To empty the thorax, in a rupture of any veſſels which open into it, bleeding is very neceſſary; which not only ſtops the hæmorrhage, by abating the force of the circulation; but likewiſe, by unloading the veſſels of their contents, makes them more fit to receive the extravaſated fluid by abſorption: gentle evacuations and pectorals are alſo very ſerviceable, and a low diet is abſolutely neceſſary.

The ſecond circumſtance in which this operation takes place, is a rupture of matter from the *pleura mediaſtinum* or lungs into the cavity of the thorax, where accumulating it at length proves fatal for want of a diſcharge. It is true, that the caſe occurs but very ſeldom, where the operation is neceſſary; becauſe, in moſt abſceſſes of the thorax, the matter

matter is usually spit up as fast as it is generated; and in the dissection of such who have died of this species of consumption, we rarely find much extravasated *pus* in the cavity, though a great portion of the lungs be destroyed. However, there are a few examples which require the operation: and these may be distinguished by the following symptoms. The patient is obliged to lie upon the diseased side, or, in case there is matter in both cavities of the thorax, on his back; because the *mediastinum* can seldom support the weight of the incumbent fluid, without suffering great pain; but this rule is not certain, it sometimes happening that the patient can lie with ease on that side where there is no fluid. Another symptom of extravasated matter, is an evident undulation of it, so that in certain motions it may be heard to quash. For the most part too, upon careful inquiry, an *œdema*, or at least a thickening of some portion of the intercostal muscles, will be discovered. And lastly, if there be much fluid, it will be attended with a preternatural expansion of that side of the chest where it lies. When therefore these signs appear after a previous pleuritic or pulmonary disorder, and the case has been attended with the symptoms of a suppuration, it is most probably owing to a collection of matter; though the patient will also labour under a continual low fever, and a particular anxiety from the load of fluid.

The last sort of fluid said to require issue from this operation is water, which however very seldom collects in such manner as to become the proper subject of the operation: for if the dropsy of the thorax be complicated with an *anasarca*, or even *ascites*, it is certainly improper; and indeed it hardly ever takes place, but where the distemper is single, and takes its rise from the same sort of disorders in the lymphatics of the pleura, as the hydrocele does from those of the *tunica vaginalis*. The symptoms of this dropsy are, a small cough without spitting, a little slow fever from the disturbance of respiration; sometimes too the water, by a sudden jerk, may be heard to quash; and, generally speaking, its weight upon the *diaphragm* and *mediastinum* are so troublesome as to oblige the patient to stoop forward, and to turn upon the affected side when he lies down; for the same reason, when there is water in both cavities of the thorax, he is forced to lie on his back.

The manner of operating, whether it be for the discharge of matter or water, is to pitch upon the most depending part of the thorax, which some have supposed to be between the eighth and ninth rib, and others between the ninth and tenth, at such a distance from the *vertebræ* that the depth of the flesh may not be an impediment to the perforation. This distance is determined to be about a hand's breadth: and here, with a knife, sciffars, or trocar, we are ordered to make the perforation; but in doing it there are a great many difficulties. In fat persons, it is not easy to count the ribs, and the wound will be very deep, and troublesome to make; it is hardly possible to escape wounding the intercostal artery, which runs in this place between the ribs. But if the only advantage proposed by the situation of the wound be derived from its dependency, the purpose of discharging the fluid will be as well answered by an opening between the sixth and seventh rib, half way from the sternum towards the spine; which, by laying ourselves down, becomes in effect as depending an orifice, as the other in sitting up; and by an opening made in this manner we avoid all the inconveniencies in the other method: For in this part of the thorax there is very little depth of muscles; the artery lies concealed under the rib; and the diaphragm is at great distance. The opening is best made with a knife, and should be about an inch long through the skin, and half an inch through the subjacent muscles; though, to make the incision with less risk of wounding the lungs, it may be adviseable to dilate it with the blunt-pointed knife (as is practised in the operation for the *bubonocele*) after having made a small puncture with a common knife. The treatment of the wound will be according to the nature of the discharge. If, after a few days, there appears no drain, you may let the orifice heal up; but if it continues, it may be kept open with a short silver canula, until such time as an alteration in that circumstance will give us leave to cicatrize with safety.

Of Encysted Tumours.

These tumours borrow their names from a cyst or bag, in which they are contained; and are farther distinguished by the nature of their contents: If the matter forming them resembles milk-curds, the tumour is called *atheroma*; if it be like honey, *meliceris*; and if composed of fat, or a suety substance, *steatoma*. The two first are not readily distinguished from one another, but their difference from the *steatoma* is easily learnt by their softness and fluctuation. These tumours appear in every part of the body, and in places where there are no glands.

The *steatoma* is never painful until by its weight it grows troublesome, nor is it a mark of general indisposition of body; so that the extirpation seldoms fails of success. The size of some of them is very large, frequently weighing five or six pounds, and there have been instances of their weighing above forty.

When the *steatoma* is irregular in its surface, with eminencies and depressions, it is suety; whereas the fat one has for the most part a uniform smooth outside. The operation for the *steatoma* will be understood by the description of that for the schirrhus.

The *atheroma* is much more common than the meliceris; at least, if all encysted tumours with matter not curdled, may, in compliance with custom, be called so: These are more frequent, and grow larger than those where the matter is curdled, being often attendant on scrophulous indispositions, which makes them more difficult of cure.

The cysts of these tumours, with the skin covering them, after a certain period of growth, resisting any further enlargement, do frequently inflame and break; but this opening is not so advantageous for the cure as extirpation by the knife, which should be done in the infancy of the swelling. When the tumours are no bigger than a small golden pippen, they may be dissected away from under the skin, by making a straight incision only through it; but if they exceed this bulk, an oval piece of skin must be cut through first, to make room for the management of the knife and taking away the tumour; in which case, it will be adviseable to take off the upper portion of the cyst with the skin; and then, by the help of a hook, to dissect away as much of the remainder of it as can be conveniently, which is a less painful and more secure method than destroying it afterwards with escharoticks. This rule is to be observed, when the cyst runs so deep amongst the interstices of the muscles, as to make it impossible to remove the whole of it, where, if we cut off a great quantity, the rest usually comes away in sloughs and matter.

The ganglion of the tendon is an encysted tumour of the meliceris

meliceris kind, but its fluid is generally like the white of an egg; when it is ſmall, it ſometimes diſperſes of itſelf; preſſure and ſudden blows do alſo remove it; but for the moſt part it continues, unleſs it be extirpated. It is no uncommon caſe to meet with this ſpecies of ganglion, running under the *ligamentum carpale*, and extending itſelf both up the wriſt and down to the palm of the hand. The cure of this diſorder cannot be effected but by an inciſion through its whole length and dividing the *ligamentnm carpale*.

The dreſſing in theſe caſes does not at all differ from the general methods of treating wounds.

Of the Amputation of the Cancered and Scirrhous Breast.

The ſucceſs of this operation is exceedingly precarious, from the great diſpoſition there is in the conſtitution, after an amputation, to form a new cancer in the wound, or ſome other part of the body. When a ſcirrhus has admitted of a long delay before the operation, the patient ſeems to have a better proſpect of cure without danger of a relapſe, than when it has increaſed very faſt, and with acute pain.

The ſcirrhus may be diſtinguiſhed, by its want of inflammation in the ſkin, its ſmoothneſs and ſlipperineſs deep in the breaſt, and generallyby its pricking pain, which as it is more or leſs, increaſes the danger accordingly; though there are ſome few with little or none in the beginning: as the tumour degenerates into a cancer, which is the worſt degree of ſcirrhus, it becomes unequal and livid, and the veſſels growing varicous, at laſt ulcerates.

In extirpating the ſcirrhus, if it be ſmall, a longitudinal inciſion will dilate ſufficiently for the operation; but if too large to be diſſected out in that manner, an oval piece of ſkin muſt be cut through firſt, the ſize of which is to be proportioned to that of the tumour; for example, if the ſwelling is five inches long, and three broad, the oval piece of ſkin cut away muſt be nearly of the ſame length, and about an inch and a half in breadth In taking off the whole breaſt, the ſkin may be very much preſerved, by making the wound of it a great deal leſs than the baſis of the breaſt, which muſt be carefully cleared away from the pectoral muſcle. This is not difficult to do, becauſe all theſe ſcirrhuſes being enlarged glands are encompaſſed with their proper membranes, which make them quite diſtinct from the neighbouring parts, and eaſily ſeparable; at leaſt this is the caſe when the tumour is moveable; for ſometimes it adheres to the ſubjacent muſcle, and that muſcle to the ribs; in which circumſtance, the operation is impracticable. When it is attended with knots in the arm pit, no ſervice can be done by amputation, unleſs the knots be taken away; for there is no ſort of dependence to be laid on their ſubſiding, by the diſcharge of the wound of the breaſt.

The bleeding of the large arteries is to be ſtopped by paſſing the needle twice through the fleſh, almoſt round every veſſel, and tying upon it, which will neceſſarily include it in the ligature. In order to diſcover the orifices of the veſſels, the wound muſt be cleaned with a ſpunge wrung out of warm water.

The ſcirrhous tumours which appear about the lower jaw, are, generally ſpeaking, ſcrophulous diſorders, that diſtinguiſh themſelves almoſt by the circumſtance of fixing on the ſalivary glands. Theſe are very ſtubborn of cure, but not ſo bad as the ſcirrhus, ſince they frequently ſuppurate, and heal afterwards: if they impoſthumate again after healing, it is for want of a good bottom, which may ſometimes be procured by deſtroying their bad ſurface with a cauſtick. Beſides theſe, there is another ſpecies of ſcirrhus in the neck, that ſucceeds better after extirpation than either of the former kind; this is an enlargement of the lymphatick glands, which run cloſe up by the jugular vein, and is diſtinguiſhable from the cancers of this part, by its moveableneſs, want of pain, the laxneſs of the ſkin covering it, the ſmall degree of preſſure it makes on the *œſophagus* and *trachea*, and laſtly the good habit of body, as it ſeldom affects the conſtitution, which cancers here do very early, after their firſt appearance. This tumour, from its ſituation, requires great exactneſs in the cutting off: they ſometimes extend up to the chin towards the mouth, and occaſion a diviſion of the ſalivary duct in operating, which proves very troubleſome to heal; but, when all other methods have failed, may be cured by a perforation into the mouth, through that part of the cheek where it is wounded, which by a tent or ſmall ſeton may be made fiſtulous; then, by properly dreſſing upon the outſide, the oozing of the *ſaliva* that way will be prevented, and the external orifice healed without difficulty.

The treatment of all theſe wounds may be with dry lint firſt, and afterwards as in common wounds.

Of the Operation *of the* Trepan.

The operation of the *trepan*, is the making one or more orifices through the ſcull, to admit an inſtrument for raiſing any pieces of bone that by violence are beaten inwards upon the brain, or to give iſſue to blood or matter lodged in any part within the *cranium*.

Fractures of the ſkull are at all times very dangerous, not in conſequence of the injury done to the *cranium* itſelf, but as the brain becomes affected either from the preſſure of the fractured bone, or that of the extravaſated blood and matter. If then the ſymptoms excited by a fracture do ſometimes follow from a mere extravaſation of blood, as is the caſe when the *cranium* is not beaten inwards, it muſt likewiſe happen that a rupture of the veſſels of this part, without a fracture, will alſo occaſion the ſame diſorders: For this reaſon, the operation may take place where the ſcull is not much offended, but only the veſſels of the *dura mater*, the *pia mater*, or the brain.

When the *cranium* is beaten inward, without any fracture, it is called a depreſſion; when very much broken, a fracture; or if broken and beat in alſo, a fracture with depreſſion; if it is only cracked without depreſſion, though properly a fracture, it is called a fiſſure; if none of theſe diſorders appear, where there is a ſuſpicion of them, the ſymptoms are imputed to a concuſſion of the brain. Theſe are the four diſtinctions in uſe, and which fully comprehend all the others.

The depreſſion of the *cranium* without a fracture can but ſeldom occur, and then it happens to children whoſe bones are more pliable and ſoft than thoſe of adults

In blows of the *cranium*, requiring the uſe of the trepan, the marks of a fracture are generally very evident, ſince the ſcalp is often lacerated ſo much, as to expoſe it to our ſight: But if the wound of the ſcalp be ſo ſmall, as only to admit a probe, we muſt judge then by the feel of the ſurface of the bone, uſing the caution of not miſtaking a ſuture for a fracture.

If there be no wound of the ſcalp, you muſt preſs about the

the head with your fingers, till the patient complains of ſome particular part, which in all likelihood is the place affected, and, if the ſcalp there be ſeparated from the *cranium*, is almoſt infallibly ſo. The ſymptoms of a fracture, are, a bleeding at the ears and noſe, a loſs of ſenſe, vomitings, drowſineſs, delirium, incontinence of urine and excrement; but what is moſt to be depended upon, is a depreſſion of the bone, or a roughneſs on its outſide; for all the other complaints not only happen to concuſſions, which do well without the application of a trepan, but likewiſe there are fractures not attended with any of them, or at leaſt in a ſlight degree; ſo that theſe ſymptoms alone, without examination of the part affected, are but an uncertain rule to go by.

In concuſſions without a fracture, that produce the ſymptoms here laid down, and do well afterwards, the veſſels of the brain and membranes are only inflamed and dilated; or if they are ruptured, they abſorb the extravaſated blood again; on which account, nature ſhould be aſſiſted by plentiful bleedings, clyſters, and other evacuations, and ſo in all fractures where the patient is not trepanned immediately: however, although people with violent concuſſions do ſometimes recover, it is ſo very ſeldom, that there can be no pretence, when they happen, for neglecting the trepan, but not being able to learn in what part the concuſſion is.

Writers diſpute very much about the poſſibility of the *contra fiſſure*, or a fiſſure occaſioned on the part of the head oppoſite to that on which the blow is given, or where the inner table is fractured while the outer one remains entire; but there are hiſtories of caſes, which, if fairly ſtated, make it unqueſtionable; and this is moſt certain, that if the complaint be at a diſtance from where the blow was received, there can be no danger in ſcalping, and applying the trepan to that part where the pain is.

When we are aſſured of a fracture or depreſſion, it is always adviſeable to trepan as ſoon as poſſible, in order to prevent the ſpreading of the abſceſs, which ſeldom fails to follow upon the rupture of the veſſels of the brain and membranes, and for the moſt part in a few days.

The manner of treating a fracture of the *cranium*, will be according to the nature of the fracture itſelf, and the injury of the ſcalp. If the wound of the head be torn into angles, perhaps cutting off the lacerated flaps will make room for the ſaw; if the bone be broken into ſeveral pieces, the pieces may be taken away with the forceps; or if ſome of the ſkull be alſo depreſſed, the removal of the pieces will, without perforating, make way for the elevator to raiſe the depreſſed part; but if the fracture be not complicated with a wound of the ſcalp, or the wound be too ſmall to admit of the operation, which ſeldom fails to be the caſe, then the fracture muſt be laid bare, by taking away a large piece of the ſcalp.

Before the application of the trepan, it is to be remembered there are certain places on the ſcull where it cannot be uſed with ſo much ſafety as on others; the whole length of the ſagittal ſuture, down to the noſe, is always mentioned as one where the perforation is dangerous, becauſe of the ſpine of the *os frontis*, and the courſe of the ſuperior longitudinal *ſinus* under this part, which it is ſuppoſed would be neceſſarily wounded by the ſaw and in conſequence deſtroy the patient by the hæmorrhage: but though a perforation may, contrary to the general opinion, be made over the *ſinus* without offending it, and, even if it was wounded, the effuſion of blood would not in all probability be mortal; yet at beſt it would be very troubleſome; and ſince we are not ſtraitened in that part of the *cranium* for room, it is adviſeable to forbear operating in this place. The bony *ſinuſes* of the *os frontis* forbid the uſe of the trepan near the orbits of the eyes; therefore, if it ſhould be depreſſed near thoſe cavities, the ſurgeon muſt be careful to perforate either above, or on one ſide of the fracture; for ſawing below it will only lead into the *ſinus*, and anſwer no purpoſe in the deſign either of giving a diſcharge to the matter from the brain, or an opportunity to elevate the depreſſion; nay, perhaps leave an incurable fiſtula, if the patient eſcapes with life.

The *os occipitis* being very uneven, both in its internal and external ſurface, makes trepanning there almoſt impracticable; beſides, the great ſinuſes run about ſo much of it, as hardly to afford ſpace to perforate without danger of wounding them; but then it is ſo defended from injuries by its ſituation and ſtrength, that fractures do not happen to it ſo often as to the other bones of the *cranium*; and when they do, for the moſt part they become ſo ſoon mortal, by affecting the *cerebellum* which it ſuſtains, that the operation is ſeldom required in this caſe. Indeed the upper angle of this bone lies above the *cerebellum*, and, when fractured or depreſſed, is not attended with ſo immediate danger; but when this happens, the courſe of the longitudinal ſinus down the middle of it, and the neighbourhood of the lateral *ſinuſes* beneath it, make it adviſeable to trepan at the lower part of the *os parietale*, or at leaſt upon or juſt below the lambdoidal ſuture, ſo that the perforation of the *os occipitis* can hardly ever be proper.

Though wounds in the cerebellum are always mortal, yet great portions of the cerebrum have been carried off, or deſtroyed, without any notable inconvenience.

The places then unfit to admit the ſaw, are the three deſcribed; that is, the ſagittal ſuture; that part of the *os frontis* near the orbits of the eyes; and the *os occipitis*. But when a fracture happens in any other part above the ear, there is no objection to the operation. When there is only a ſmall fiſſure without any depreſſion or motion in the bone, the trepan may be applied on the fiſſure itſelf, which will more readily give vent to the blood or matter underneath, than if made at a diſtance. If the fiſſure be large, and the bone weakened or depreſſed, the trepan muſt be applied on one ſide of it, but ſo as to make it a part of the circumference of the ſawed piece; if the fracture run upwards, it will be eligible always to perforate near its bottom, becauſe the dependency of the orifice will give better iſſue to the matter, though the ill-grounded apprehenſion of the brain falling out there has made many eminent ſurgeons contradict this rule in their practice. If, by making one orifice, you cannot raiſe all the depreſſed part, you muſt make a ſecond and a third, and continue doing ſo, till you have reduced the whole cranium even: there is frequently occaſion to repeat it twice or thrice; and it has been done twelve times, nay oftener, with ſucceſs; which ſhews the little danger there is, either in ſawing the ſkull, or expoſing the *dura mater* and brain, when the preſſure is taken off. Indeed the miſchief of laying the brain bare is ſo ſmall, compared with a concuſſion of it, or an abſceſs from pent-up matter, that thoſe fractures of the ſkull, where the bone is broken into ſplinters the whole extent of it, and can be taken away, much more readily do well, than a ſimple fiſſure only, where the abſceſs cannot diſcharge itſelf freely; for which

which reaſon, though the depreſſed fracture may be raiſed by the means of one orifice, yet, if it is of a conſiderable length, it will be almoſt abſolutely neceſſary to make one or two more openings, for the convenience of diſcharge; ſince, for want of this, we ſee abſceſſes increaſe daily in their quantity of matter, and at the end of a few weeks carry off the patient.

In concuſſions of the brain without a fracture of the cranium, if the trepan be applied, and vaſt diſcharges enſue, it will be alſo convenient to make more perforations into the abſceſs and the neighbourhood of the abſceſs, the ſituation of which will be eaſily gueſſed by the direction of the ſtream of matter. And here it is to be obſerved, that abſceſſes which enſue from a concuſſion are generally more extenſive and dangerous than thoſe which accompany a fracture with depreſſion: for in a fracture, the yielding of the bone deſtroys, in a great degree, the force of the ſtriking body, and prevents any violent commotion of the brain; ſo that what the brain ſuffers reſults chiefly from the preſſure of the incumbent bone, and the laceration of the veſſels, near the fracture: whereas, when the cranium reſiſts the ſhock, all, or great part of the *cerebrum* ſuſtains the concuſſion, and is often impoſtumated or inflamed almoſt in its whole dimenſion.

The manner of trepanning is this: Having fixed your patient's head ſteady, either on the bolſter of a bed, or by placing him in a low chair; with the pin of your ſaw, mark the center of the piece of bone to be taken out; then with the perforating trepan, make an orifice deep enough to receive the pin, which being fixed in it will prevent the ſaw from ſlipping; and thus you are to continue ſawing, till the impreſſion made will preſerve the ſteadineſs without the pin, when it is to be taken away, for fear of its wounding the brain before the ſaw has entered through the cranium, which it would do at laſt, becauſe of its projection. In working through the bone, the teeth of the ſaw will begin to clog, by that time you arrive to the *diploe*; wherefore a bruſh muſt be ready to clean it every now and then, and with a pointed probe you muſt clear away the duſt in the circle of the trepanned bone, obſerving, if it be deeper on one ſide than the other, to lean afterwards on that ſide where the impreſſion is leaſt, that the whole thickneſs may be ſawed through at the ſame time. To do all this with leſs interruption, it will be proper to have two ſaws of exactly the ſame diameter, that an aſſiſtant may be bruſhing one while you operate with the other. We are adviſed to ſaw boldly till we come to the *diploe*, which, it is ſaid, will always diſtinguiſh itſelf by the bloodineſs. But, however, this is not a certain mark to go by: for though, where there is a *diploe*, it will manifeſt itſelf by its bloodineſs, yet ſometimes the ſcull is ſo very thin as not to admit of any; in which caſe, if an operator ſhould puſh on his inſtrument in expectation of meeting with this ſubſtance, he would unwarily wound the brain. This is not very often the caſe; but, however, often enough to put a man on his guard, and make him inquire whether the bone be looſe after a little ſawing, which is the only rule we go by when we have paſſed through the *diploe*, and may as well be attended to before coming at it, without any conſiderable loſs of time. When it is quite ſawed through, and lies looſe, it may be taken away with the forceps contrived for that uſe; and if the lower edges of the orifice, next to the *dura mater*, are ſplintered, they may be ſcraped ſmooth with a lenticular.

Theſe are the chief proceſſes of the operation of the trepan. The only thing remaining to be done, is, with an elevator introduced at the orifice, to raiſe the depreſſion, or broken ſplinters, if they cannot otherwiſe be laid hold of, and to draw out the grumous blood, or any other extraneous body. If the *dura mater* be not wounded or torn, an inciſion muſt be made through it, to give way to the blood or matter, which almoſt certainly lie underneath it, if the ſymptoms have been bad, and none has been diſcharged from between the *cranium* and *dura mater*: Though it has been lately obſerved that an abſceſs will ſometimes be formed in the ſubſtance of the brain; and therefore, if the puncture of the *dura mater* does not procure an evacuation of the matter, and the ſymptoms of a ſuppuration are ſtill urgent, it will be adviſeable to make a ſmall inciſion with a lancet into the brain itſelf.

We have uſed the word trepan all along, for the ſake of being better underſtood; but the inſtrument here recommended is a trephine; the advantages of which, as alſo that of a cylindrical ſaw, or one nearly cylindrical, are deſcribed in the explanation of the copper-plate.

With regard to the dreſſings of theſe wounds, it is very certain, that as the greateſt part of the evil proceeds from the quantity and preſſure of the matter, whatever approaches towards the nature of a tent, and increaſes its quantity and preſſure by locking it up, muſt be pernicious. Therefore the uſe of all ſyndons whatever ſhould be excluded. The haſty application too of ſpirits of wine, which is ſo commonly adviſed, cannot be proper; as they are not only unfit for inflammations in general, but alſo criſp up the veſſels of the *dura mater* and brain, and, ſtopping the ſuppuration, ſometimes produce a gangrene. Since then a cloſe application is inconvenient, and, whatever good there may be in topical medicines, it cannot for the moſt part be communicated to the abſceſs, by reaſon of its extent beyond the orifice, the beſt remedy will be dry lint only, which muſt be laid on looſely to give vent to the matter, and be repeated twice a day till the diſcharge is leſſened, when once in twenty-four hours will be ſufficient to the finiſhing of the cure, which will be ſomething retarded by the exfoliations that ſometimes follow this operation. The patient afterwards may wear a plate of tin upon the ſcar, to defend it from blows or any accidental injury.

Explanation of Fig. 1. Plate CLVIII.

A, The perforator, commonly called the perforating trepan. With this inſtrument, an orifice is uſually made for the reception of the pin, on the centre of the piece of bone that is to be taken away, in the operation of trepanning; though if the pin be very ſharp, and project but little beyond the teeth of the ſaw, as in that marked with the letter *B*, the perforator would be needleſs; but as the point of the pin preſently grows blunt with uſe, and in that caſe it is difficult to fix the ſaw, it is adviſeable to have this inſtrument in readineſs. It is alſo handy for boring into the ſubſtance of the bones, in order to promote a granulation of fleſh on their ſurfaces. When it is made uſe of, it muſt be received and faſtened in the handle *C*.

B, The crown, or ſaw of the trepan, with the pin appearing juſt beyond the extremities of the teeth. The ſhape of this ſaw is cylindrical.

C, The handle of the foregoing inſtrument, called the trephine; which is much preferable to the trepan, (an inſtrument like a wimble uſed by joiners,) becauſe of the great

great convenience of holding it, and leaning on one ſide or other of the ſaw, as we find it neceſſary: The trepan however, though allowed to be unhandy, is the inſtrument moſt uſed by ſurgeons in other parts of Europe, upon the ſuppoſition of its working quicker than the trephine.

The trephine here repreſented is of ſuch a ſhape as to make it a convenient elevator, for which purpoſe the extremities of it are made rough.

D, A key to take out the pin *E*, when the ſaw has made an impreſſion deep enough to be worked without the help of it.

Explanation of Fig. 2. Plate CLVIII.

A, A convenient forceps to take out the circular piece of bone, when it does not ſtick to the ſaw: the contrivance by which they readily lay hold of it, is to make the extremities that are to graſp it, with an arch of the ſame circle as the ſaw is made. Upon one of the handles, there is added a little elevator, to lift up any ſmall ſplinter of bone.

B, A lenticular: the fore-part of its blade is ſharp, in order to ſcrape the lower edge of the orifice of the *cranium*, in caſe any ſplinters ſhould remain after the operation; and the button at its extremity receives the duſt, that it may not fall on the brain; but there is ſeldom any occaſion for this inſtrument.

C, A rugine or raſpatory, for ſcraping bones in order to promote granulations of fleſh. The handles of theſe two laſt inſtruments are wood, whereas every part of the others ſhould be made of ſteel.

Of the Cataract.

The cataract, called by the Latins *ſuffuſio*, is a diſeaſe of the cryſtalline humour, rendering the whole body of it opake, ſo that the rays of light, which, in the natural ſtate of its tranſparency, were tranſmitted to the *tunica retina*, become now totally intercepted, and produce no effect. This is pretty nearly the account delivered down to us by Hippocrates and the ancient Greeks, who likewiſe knew it by the name of *glaucoma*.

Anatomiſts have frequently diſſected the eyes of perſons under this diſorder after their death, and have found it to be always an opacity of the cryſtalline humour, agreeably to the definition of a *glaucoma*: ſo that by conſequence we muſt underſtand the words *cataract* and *gloucoma* as ſynonymous terms.

The general criterion of the fitneſs of cataracts for the operation, is taken from their colour; the pearl coloured, and thoſe of the colour of burniſhed iron, are eſteemed proper to endure the needle; the white are ſuppoſed milky, the green and yellow horny and incurable.

The depreſſion of a cataract of any colour would be the cure, if that alone was the diſtemper of the eye: but it generally happens, that the yellow cataracts adhere to the *iris* ſo firmly as to become immoveable; beſides, when they follow in conſequence of a blow, which is often the caſe, either the cells of the vitreous humour are ſo much diſturbed and broken, or the *retina* affected, that a degree of blindneſs will remain, though the cataract be depreſſed.

To judge whether the cataract adheres to the *iris*, if you cannot at once diſtinguiſh it by your ſight, ſhut the patient's eye, and rub the lids a little; then ſuddenly opening it, you will perceive the pupil contract, if the cryſtalline humour does not prevent the action by its adheſion: And when this is the caſe in any kind of cataract, the operation can hardly be adviſed.

Another conſideration of the greateſt moment, before undertaking the cure, is to be aſſured of the right ſtate of the *tunica retina*; which is very readily learnt, where there is no adheſion of the cataract, from the light falling between the *iris* and cryſtalline humour, which if the eye is not ſenſible of, it is a certain indication of another malady, and abſolutely forbids the operation. Generally this cataract takes its riſe from head-achs, convulſions, and nervous diſorders.

When none of theſe objections forbid the operation, it may be thus done: Having placed your patient in a convenient light, and in a chair ſuitable to the height of that you yourſelf ſit in, let a pillow or two be placed behind his back, in ſuch a manner, that the body bending forward, the head may approach near to you; then inclining the head a little backward upon the breaſt of your aſſiſtant, and covering the other eye ſo as to prevent its rolling, let the aſſiſtant lift up the ſuperior eye-lid, and yourſelf depreſs a little the inferior one: This done, ſtrike the needle through the *tunica conjunctiva*, ſomething leſs than one tenth of an inch from the *cornea*, even with the middle of the pupil, into the poſterior chamber, and gently endeavour to depreſs the cataract with the flat ſurface of it. If, after it is diſlodged, it riſes again, though not with much elaſticity, it muſt again and again be puſhed down. If it is membranous; after the diſcharge of the fluid, the pellicle muſt be more broke and depreſſed: if it is uniformly fluid, or exceedingly elaſtick, we muſt not continue to endanger a terrible inflammation, by a vain attempt to ſucceed. If a cataract of the right eye is to be couched, and the ſurgeon cannot uſe his left hand ſo dexterouſly as his right, he may place himſelf behind the patient, and uſe his right hand.

We have not recommended the *ſpeculum oculi*, becauſe, upon the diſcharge of the aqueous humour through the puncture, the eye, being ſomewhat emptied, more readily admits of the depreſſion of the cryſtalline humour, than when preſſed upon by the inſtrument.

As to the method of treating the ſucceeding inflammation, bleeding and other gentle evacuations are found abſolutely neceſſary.

Of Cutting the Iris.

There are two caſes where this operation may be of ſome ſervice; one when the cataract is from its adheſion immoveable; and the other, when the pupil of the eye is totally cloſed up by a diſorder of the muſcular fibres of the *iris*, which gradually contracting the orifice, at laſt leaves the membrane quite imperforate. This laſt diſtemper has hitherto been deemed incurable. The adheſion of the cataract has been conſidered as a ſpecies of blindneſs not to be relieved: but Mr *Cheſelden* has invented a method of making an artificial pupil, by ſlitting the *iris*, which may relieve in both the inſtances here ſtated.

In doing this operation, the patient muſt be placed as for couching, and the eye kept open and fixed by the *ſpeculum oculi*, which is abſolutely neceſſary here; then introducing the knife in the ſame part of the *conjunctiva* you wound in couching, inſinuate it with its blade held horizontally, and the back of it towards you, between the *ligamentum ciliare* and circumference of the *iris*, into the anterior chamber of the eye; and after it is advanced to the farther ſide of it,

make your incision quite through the membrane; and if the operation succeeds, it will upon wounding fly open, and appear a large orifice, though not so wide as it becomes afterwards.

The place to be opened in the *iris*, will be according to the nature of the disease: if the membrane itself be only affected with a contraction, the middle part of it, which is the natural situation of the pupil, must be cut; but if there be a cataract, the incision must be made above or below the cataract, though it is more eligible to do it above.

The contracted *iris*, from a paralytic disorder, is so often complicated with an affection of the *retina*, that the success is very precarious in this case. This operation has answered best in adhesions of the crystalline humour, though but very seldom even there.

Explanation of Fig. 3. Plate CLVIII.

A, The couching needle, the broad part of which towards the point is flat on one side; but on the other is a little convex to give it more substance and strength.

The handle of this instrument is white ivory, inlaid with a streak of black in that part of it lying even with the convex surface of the blade: The meaning of which is, that by holding the handle with the streak upwards, we may be guided to depress the membrane of a milky cataract with the flat surface, though the substance of the cataract swimming in the eye obscures the needle, and prevents its being directed in a proper position by the sight.

B, A *speculum oculi*, which is made to open or shut by an iron button sliding along a slit in the handle. This instrument is composed of one piece of steel, in such a manner that it would fly open by its elasticity, if the two branches of the handle were not confined by the button. The circle of it should be covered with velvet, to make it lie softer on the eye-lids.

C, The knife for cutting the *iris*, the blade of which has two edges, resembling a lancet, which are more advantageous than one only, in cutting the *cornea* for the extraction of the cataract.

Of the Fistula Lachrymalis.

The *fistula lachrymalis* is generally understood to be such a disorder of the canals leading from the eye to the nose, as obstructs the natural progress of the tears, and makes them trickle down the cheek: but this is only the first and mildest stage of the disease. In the next, there is a mucus resembling matter, and afterwards matter itself discharged with the tears from the *puncta lachrymalia*, and sometimes from an orifice broken through the skin between the nose and angle of the eye. The last and worst degree of it is, when the matter of the abscess, by its long continuance, has not only corroded the neighbouring soft parts, but also affected the subjacent bone.

Monsieur Annell, a French surgeon, recommends in the recent fistula, to pass a small probe through one of the *puncta lachrymalia* into the *saccus* and nose, in order to break the concretions which were supposed to make the obstruction, and with a small pipe and syringe to throw an injection through the other, in order to wash them away.

The manner of operating in those cases where perforation is not required, is this: Supposing the abscess not broken, chuse a time when it is most turgid with matter; and to his end, you may shut the patient's eye the day before, and lay little slips of plaister upon one another across the lids, from about the *puncta lachrymalia* to the internal angle; which compressing their channels, and preventing the flux of the matter that way, will heap it up in the bag, and indicate more certainly the place to be cut. If the abscess is already open, the orifice and probe will inform you where to enlarge: then placing the patient in a seat of convenient height for the management of your hand; with a small incision-knife dilate from the upper part of the bag, down to the edge of the orbit, without any regard to the tendon of the orbicularis muscle, or fear of wounding the blood-vessels; though if you see the vessels, it is proper to shun them. The length of this incision, will be near four tenths of an inch. It has been advised, in opening the bag, to introduce a small probe through one of the *puncta* into its cavity, to prevent wounding the posterior part of it. But this excess of care may be more troublesome than useful; since, in so large a vessel, a very small share of dexterity is sufficient to avoid the mistake. In making this incision, care must be had, not to cut too near the joining of the eye-lids, because of the deformity of the succeeding scar; though the blear eye or uneven, contraction of the skin in that part, after the operation, is generally owing to the use of the cautery, and not to the wound of the tendon of the orbicularis muscle; for this last is necessarily from its situation always cut through, but without any inconvenience, because of the firm cicatrix afterwards that fixes it strongly to the bone.

When the bag is open, it is to be filled with dry lint, which the next day may be removed, and exchanged for a dossil dipt in a soft digestive medicine: this must be repeated every day once or twice, according to the quantity of the discharge; now and then, when the matter is not good, using the precipitate medicine, and from time to time a sponge-tent, to prevent the too sudden reunion of the upper part of the abscess. When the discharge begins to lessen, it will be proper to pass a small probe, a small bougie, or silver wire, through the nasal duct into the nose every time it is drest, in order to dilate it a little, and make way for the tears and matter which by their drain will continue to keep it open. This method must be followed till the discharge is nearly over (which will be in a few weeks;) and then dressing superficially with dry lint, or any drying application, the wound will seldom fail of healing. After the cure, in order to prevent a relapse, it will be proper, for a few weeks, to wear the compressing instrument represented in the copperplate.

When the bone is bare, and the fistula requires perforation, the perforator is not to be carried down the *ductus ad nasum*, for fear of boring into the *sinus maxillaris*; but more internally towards the nose, which will bleed freely, if properly wounded. The wound afterwards should be dressed with dossils, in the manner above described, and the probe or silver wire be every day passed through the *ductus ad nasum*, lest, after the cure of the abscess, it should still remain obstructed; and if, upon trial, the duct should be so filled up as not to admit the wire, it will be right to keep open the perforation into the nose with a small tent, till the discharge is almost quite ceased.

Explanation of Fig. 4. Plate CLVIII.

A, The eye, with the skin of the eye-lids denuded, in order to shew the orbicularis muscle: the white streak running from the inner angle of the eye toward the nose is the tendon

tendon of the orbicularis muscle. At a little distance from the internal angle, on the edge of the eye-lids may be observed two black spots, which are the orifices of the lachrymal channels, and called the *puncta lachrymalia*.

B, The exact dimension of the lachrymal channels and bag; the pricked line represents the edge of the orbit.

C, A small incision-knife, more handy than a larger for opening the bag

D, The perforator to destroy the *os unguis*, if ever it should happen to be necessary.

E, An iron instrument made thin and pliable, to set even on the forehead, and for use covered with velvet: the holes at the three extremities receive two pieces of ribband, by which it is fastened on the forehead: the button at the end of the screw is to be placed on the *saccus lachrymalis*, and the screw to be twisted till the button makes a considerable pressure on the bag: the button should be covered with velvet, and a little compress of plaister be laid on the bag before it is applied, to prevent the skin from being galled by the pressure. The little branch of iron which receives the screw must be soft enough to admit of bending, otherwise it will be difficult to place the button exactly on the bag. This instrument is for the left eye only; it should be worn night and day in the beginning of a fistula, and after a fistula has been healed by incision; but as the success depends upon the exact situation of the button upon the bag, it should be carefully looked after.

Of Bronchotomy.

The operation of *bronchotomy* is an incision made in the *aspera arteria*, to make way for the air into the lungs, when respiration is obstructed by any tumour compressing the *larynx*, or some other disorder of the *glottis* and *aspera arteria*, without any apparent tumour.

The manner of doing it, is by making a longitudinal incision through the skin, three quarters of an inch long, opposite to the third and fourth ring of the trachea, if you have the choice of the place; and when you cannot make it so high, the rule will be to wound a little below the tumour: it is always advised to pinch up the skin for this process, which however may be left to the discretion of the surgeon. When the skin is cut through, you must make a small transverse incision into the wind-pipe, and immediately introduce a silver crooked *canula* near half an inch long, with a couple of little rings at the top of it, through which a ribband may be passed round the neck, to keep it fixed in the wound.

The method of dressing will be easily understood; since, after the patient can breathe by the natural passage, if you withdraw the hollow tent, the wound will become a simple one, and, notwithstanding its penetration through a cartilage into a large cavity, require a superficial application only.

Of the Extirpation of the Tonsils.

These glands sometimes grow so large and scirrhous as to become incurable, and even to threaten suffocation if not extirpated. The manner of doing this operation formerly, was by cutting them off: but the almost constant consequence of this wound was a violent bleeding, and sometimes too a mortal one; on which account it is rejected in favour of the ligature, which is not only void of danger, but also seldom fails of cure.

If the basis of the tonsil is smaller than the upper part, you may pass the ligature by tying it to the end of a probe, bent into the form of an arch, and set into a handle; which being carried beyond the gland, and round it, is to be brought back again: this done, you may easily tie it by the means of an instrument of Mr. *Chefelden*'s contrivance, which holds one end of the string on the side of the tonsil next the throat, while you make the knot by pulling the other with the right hand quite out of the mouth, as will be easily understood by the draught in the copper-plate. Should it happen that the tonsils are conical, so that the ligature will necessarily slip over its extremity when we attempt to tie; in this case, he has recommended an instrument like a crooked needle, set in a handle, with an eye near the point, threaded with a ligature, which is to be thrust through the bottom of the gland, and being laid hold of with a hook, the instrument is to be withdrawn; then pulling the double ligature forwards, it must be divided, and one part be tied above, and the other below the tumour: the knots are to be always double, and the ligature to be cut off pretty near them.

If after four or five days they slip, or seem to have mortified the tonsil only in part, you must repeat the whole operation; and if it fail a second time, you must even repeat it again.

This kind of extirpation is more practised in large piles, that are esteemed incurable. When the piles are withinside of the intestine, you must place your patient over a fomentation in a closestool, and have a crooked needle with a double ligature ready to pass through them, when by straining they are pushed out of the *anus* (for sometimes the intestine will return suddenly,) and tie above and below as in the instance of the tonsil. Sometimes the piles are of that shape as to admit a single ligature to be tied round them without the help of a needle, which is less painful. If there are several, you must only tie one or two at a time; for the pain of the ligature is excessive, and would be intolerable if many were tied at once: however, every five or six days, the operation may be repeated till all are extirpated, and the parts must be kept supple by some emollient ointments.

When the piles are small, they may safely and with much less pain be cut off.

The *uvula* is subject to so great a degree of relaxation sometimes, that it almost choaks the patient; the readiest cure is cutting off all but half an inch of it, which may be done at one snip with a pair of scissars (particularly curved for that purpose,) laying hold of it with a forceps, lest it should slip away.

Explanation of Fig. 5. Plate CLVIII.

A, The bent probe fixed in a handle, with the ligature made of the same thread as the ligatures for tying the blood-vessels.

B, The iron instrument for tying the tonsils.

This instrument is also of great service in extirpating, by ligature, a species of scirrhus that sometimes grows from the neck or cavity of the *uterus*.

C, The needle with the eye towards the point, for passing the ligature through the tonsil, when the basis is larger than the extremity.

D, A *canula* made of silver to be used in the *empyema*.

E, A *canula* to be used in *bronchotomy*.

To keep the canulas in their place, small ribbands may be

be passed through the rings of them, and carried round the body and neck; or they may be held by a ligature run through, and fastened to a hole cut in a piece of sticking plaister, which is to be laid on each side of them.

Of the Polypus.

The polypus of the nose, is said to be an excrescence of flesh, spreading its branches amongst the *laminæ* of the *os ethmoides*, and through the whole cavity of one or both nostrils. It happens very often to both sides of the nose at once; and in that case is very troublesome, almost suffocating the patient, at least making respiration very difficult. The intent of the operation is the removal of this obstacle.

Polypi arise from the membrane spread upon the *laminæ spongiosæ*, pretty nearly in the same manner as the *hydatids* of the *abdomen*, in one kind of dropsy, do from the surface of the liver; or as ganglions from the tendons, borrowing their coats from a production of its fibres and vessels: If they appear soft, and of the colour of the serum of the blood, in all likelihood they are formed of such a sort of water contained in cysts, which, upon breaking the membrane, leaves so little hold for the instrument, that but a small part of it can be extracted afterwards. This *polypus* is to be left to harden, before the operation be undertaken, which in process of time it generally will do. In the next degree of consistence, they retain pretty nearly the same colour, and are often partly watery, and partly of a viscid texture, which though not tenacious enough to admit of drawing them out by the roots, may at several attempts be taken away by bits. The next degree of consistence, is that which is neither so soft as to be squezeed to pieces, nor so hard and brittle as to crumble, or adhere to the membrane with that force as not to admit of separation: this is the most favourable one. The last, is hard and scirrhous, adhering so tight as to tear rather than separate in the extraction, and sometimes even tends to degenerate into a cancer: This *polypus* is very difficult of cure.

The *polypus* sometimes dilates to that degree, as not only to extend beyond the *os palati*, and hang over the *œsophagus* and *trachea*; but also spreading into the *sinus maxillaris*, so exactly fills up every interstice of the nose, as to obstruct the lower orifice of the *ductus ad nasum*, and prevent the descent of the tears, which necessarily must return thro' the *puncta lachrymalia*; and sometimes they grow so enormously large, as even to alter the shape of the bones of the face.

When the *polypus* appears in the throat, it is always adviseable to contract it that way; it being found, by experience, more ready to loosen when pulled in that direction, than by the nose. To this end, it would be right, before undertaking the operation, to let your patient lie supine two or three hours, which will bring it still farther down; for the body of the *polypus* does not universally adhere, and will by its weight stretch out the fibres by which it is connected to the nose; nay, there are instances, where by a little effort, such as hawking, they have dropt quite off.

The method of extracting it is by a pair of forceps, with a slit at their extremities for the better hold, which must be introduced into the nostril about an inch and a half, to make more sure of it towards the roots; then twisting them a little from one side to the other, you must continue in that action, while you pull very gradually the body of the *polypus*. If it break, you must repeat the extraction as long as any remains, unless it is attended with a violent hæmorrhage, which is an accident that sometimes follows upon the operation, and seldom fails when the excrescence is scirrhous: However, the surgeon is not to be alarmed at the appearance of an immoderate effusion the moment after the separation; for, generally speaking, the vessels collapse very soon again; but if they do not, dry lint, or lint dipt in some styptick, will readily stop it.

After the extirpation, it has been usual, in order to prevent a relapse, to dress with escharotick powders, and even to burn with the actual cautery; but neither the one or the other can be of great service in this case, and both are painful and dangerous. If ever the use of corrosive medicines is adviseable, it should be for destroying the remainder of a *polypus* which cannot all be taken away; and then the escharoticks may be better conveyed to the part by a long tent, than a seton passed through the nose and mouth, which is difficult to do without hurting the patient, and very nasty to bear.

Of the Hare Lip.

This disease is a fissure in the upper lip, with want of substance, and is a natural defect, the patient being always born with it, at least that species of hare-lip which requires the following operation. The cure is to be performed by the twisted suture. There are many lips, where the loss of substance is so great, that the edges of the fissure cannot be brought together, or at best where they can but just touch, in which case it need not be advised to forbear the attempt: it is likewise forbidden in infants, and with reason if they suck; but otherwise it may be undertaken with great safety, and even with more probability of success than in others that are older.

It is not uncommon for the roof of the mouth to be fissured likewise; but this is no objection to the operation, if the skin of the lip is loose enough to admit of re union: and it may be remarked, that the fissure of the palate, in length of years, closes surprisingly in some cases.

The manner of doing it is this. You first with a knife separate the lip from the upper jaw, by dividing the *frænulum* between it and the gums; and if the *dentes incisorii* project, as is usual in infants, they must be cut out with the same knife; then with a thin pair of straight scissars take off the callous edges of the fissure the whole length of it, observing the rule of making the new wound in straight lines, because the sides of it can never be made to correspond without this caution. For instance, if the hare lip had the shape *a*, Plate CLVIII. fig. 5 the incision of the edges must be continued in straight lines till they meet in the manner represented by *b*, ibid. The two lips of the wound being brought exactly together, pass a couple of pins, one pretty near the top, and the other as near the bottom, through the middle of both edges of it, and secure them in that situation by twisting a piece of waxed thread cross and round the pins seven or eight times; you must then cut off the points, and lay a small bolster of plaister underneath them, to prevent their scratching: but when the lower part only of the hare lip can be brought into contact, it will not be proper to use more than one pin.

The pins are made three fourths of their lengths of silver, and the other part towards the point of steel; the silver pin is not quite so offensive to a wound as a brass or steel one; but

but a ſteel point is neceſſary for their eaſier penetration, which indeed makes them paſs ſo readily, that there is no need of any inſtrument to aſſiſt in puſhing them through. The practice of bolſtering the cheeks forward does little or no ſervice to the wound, and is very uneaſy to the patient. The manner of dreſſing will be to remove the applications which are quite ſuperficial, as often only as is neceſſary for cleanlineſs. The method is to deſiſt the three firſt days, and afterwards to do it every day, or every other day: It is not at all requiſite to dreſs between the jaw and lip where the *frænulum* was wounded, there being no danger that an inconvenient adheſion ſhould enſue. In about eight or nine days the parts are uſually united, and in children much ſooner, when you muſt gently cut the threads, and draw out the pins, applying upon the orifices a piece of plaiſter and dry lint. It will be proper, in order to withdraw the pins more eaſily, to daub the ligatures and pins with warm water, and alſo moiſten them with ſweet oil, two or three days before you remove them, which will waſh off the coagulated blood, that would otherwiſe faſten them ſo hard to the ligature as to make the extraction painful.

Of the Wry Neck.

The operation of cutting the wry neck is very uncommon, and is never to be practiſed but when the diſorder is owing to a contraction of the *maſtoideus* muſcle only; as it can anſwer no purpoſe to ſet that muſcle free by dividing it, (which is all that is to be done,) if the others in the neck are in the ſame ſtate; and more eſpecially if it has been of long ſtanding from infancy; becauſe the growth of the *vertebræ* will have been determined in that direction, and make it impoſſible to ſet the head upright.

When the caſe is fair, the operation is this. Having laid your patient on a table, make a tranſverſe inciſion thro' the ſkin and fat, ſomething broader than the muſcle, and not above half an inch from the *clavicle;* then paſſing the probed razor with care underneath the muſcle, draw it out and cut the muſcle. The great veſſels of the neck lie underneath; but when we are aware of their ſituation, the danger of wounding them may be avoided. After the inciſion is made, the wound is to be crammed with dry lint, and always dreſſed ſo as to prevent the extremities of the muſcle from re-uniting; to which end they are to be ſeparated from each other as much as poſſible by the aſſiſtance of a ſupporting bandage for the head, during the whole time of the cure, which will generally be about a month.

Explanation of Fig. 6. Plate CLVIII.

A, The inſtrument called the probe razor to cut the *maſtoideus* muſcle in the wry neck, and is ſharp only about half its length at that end where the blade is broad.

B, The two pins with the twiſted ſuture, uſed in the hare-lip.

C, The *polypus* forceps, with one of the rings open for the reception of the thumb, which would be cramped in pulling the forceps with much force, if it were received in the ſame ſort of ring as in the other handle.

Of the Aneurism.

This is a diſeaſe of the arteries, in which, either by a preternatural weakneſs of any part of them, they become exceſſively dilated; or by a wound through their coats, the blood is extravaſated amongſt the adjacent cavities. The firſt ſpecies of *aneuriſm* is incident to every part of the body, but does not often happen, except to the curvature of the *aorta*, which is ſubject to this diſorder from the extraordinary impulſe of the blood on that part: from the curvature, it runs upwards along the carotids or ſubclavians, generally increaſing, till by its great diſtenſion it is ruptured, and the patient dies.

There are ſeveral hiſtories given of *aneuriſms* of the curvature of the *aorta;* in ſome of which, the veſſel has been ſo exceſſively dilated, as to poſſeſs a great ſpace of the upper part of the *thorax;* and the moſt curious circumſtance to be gathered from them is, that the ſpot of the veſſel which is weakeſt, and where the diſeaſe begins, generally gives way in ſuch a manner to the force of the blood continually puſhing it outwards, as to form a large pouch or cyſt, with coats nearly as thick as thoſe of the artery itſelf. However, the thickneſs of the coats of theſe cyſts will laſt but to a certain period; for when the veſſels of the coats can no longer conform to the extenſion, the circulation grows languid, the cyſt becomes thinner at its apex, and ſoon after burſts.

The ſymptoms of this *aneuriſm*, are a ſtrong pulſation againſt the *ſternum* and ribs; every *ſyſtole* of the heart; and, when it extends above the *ſternum*, a tumour with pulſation. Upon diſſection, the ribs, *ſternum*, and *clavicle*, are ſometimes found carious, from the obſtruction of the veſſels of the *perioſteum*, which are preſſed by the tumour.

What we have ſpoken of hitherto, has been only the *aneuriſm* of the *thorax* from an internal diſorder; *aneuriſms* of the extremities, are for the moſt part owing to wounds, though when they happen of themſelves, they differ very little from the deſcription given of that in the *thorax*. The further ſymptoms of them are (beſides pulſation) the tumour's being without diſcolouration of the ſkin; its ſubſiding when preſſed by the hand, and immediately returning when the hand is taken away; though, if it be upon the point of burſting, the ſkin will grow inflamed, and the coagulated blood in the cyſt will ſometimes make the pulſation much leſs perceptible.

This ſpecies of *aneuriſm* may ſometimes be ſuported a great number of years, if we reſiſt its dilatation by proper bandage; but if we do not, there is danger of its burſting, and, if it be pretty large, of rotting the adjacent bones.

A ſound artery wounded through part of its external coat would in all probability produce nearly the ſame appearances as where the whole coat is weakened from an internal indiſpoſition; and this moſt likely is the caſe after bleeding in the arm, when it has not been immediately perceived that the artery was pricked, and the tumour has begun to form ſome days after the puncture; though the common appearance of an *aneuriſm* from the wound of a lancet, is a diſcharge of blood firſt through the orifice of the ſkin, and, upon being ſtopt from bleeding outwardly, an inſinuation of it among all the muſcles as far as it can ſpread, in the ſhoulder and arm: here, the arm grows livid from the *ecchymoſis*, and the blood coagulating to the conſiſtence of fleſh, prevents any ſenſible pulſation. The cyſt which ariſes near the orifice of the artery is formed by the cellular capſula enveloping the veſſels of that part, and a portion of the *aponeuroſis* of the biceps muſcle, which admitting of ſome extravaſated blood underneath it, become exceſſively thickened and expanded. Theſe membranes muſt make the cyſt, otherwiſe we could not, upon opening the tumour in the operation,

peration, discover so readily the puncture; or if the coats of the artery made it, we could not separate it distinctly from the vessel, which would be always dilated above and below the cyst, as we see in other *aneurisms*.

There are some few instances of small *aneurisms* and punctures of the artery from bleeding, doing well by bandage; but they almost all require the operation at last, which is to be performed nearly in the same manner in every part; and supposing it in the bend of the arm, is to be done after the following method.

Having applied the tourniquet near the shoulder, and laid the arm in a convenient situation, make an incision on the inside of the *biceps* muscle, above and below the elbow a considerable length, which, being in the course of the artery, will discover it as soon as you have taken away the coagulated blood, which must be all removed with the fingers, the wound being dilated sufficiently for that purpose. If the orifice does not readily appear, let the tourniquet be loosened, and the effusion of blood will direct you to it; then carefully carrying a crooked needle with a ligature under it, tie the vessel just above the orifice; and passing the needle again, make a second ligature below it, to prevent the return of the blood, and leave the intermediate piece of the vessel to slough away without dividing it. To avoid wounding or tying the nerve in making the ligature, the artery may be cleared away from it first, and held up with a hook; but should the nerve be tied with the artery, no great inconvenience would ensue from it. After the operation, the arm must be laid easy, on a pillow in bed, and the wound be treated in the common method, keeping it in that posture a fortnight or three weeks, especially if it should swell much, and not digest kindly.

In doing this operation, it will be proper to have the amputating instruments ready, lest it should be impracticable to tie the artery; and even after having tied it, the arm must be carefully watched; and in case of a mortification, it may be taken off.

Of Amputation.

A spreading mortification has been always esteemed so principal a cause for amputation, that it is a fashion with writers to treat of the nature of a gangrene previous to the description of this operation. However, this operation is spoken of as frequently unsuccessful; and in length of time, its want of success has been so unquestionably confirmed by repeated experiments, that some of the most eminent practitioners make that very circumstance an exception to the operation, which so few years since was the great inducement; and the maxim is, never to extirpate till the mortification is absolutely stopped, and even advanced in its separation.

Gangrenes may be produced two ways; either by indisposition of body, or by accident in a healthful state: for as the life of a part depends upon the circulation of its fluids, whatever shall make the circulation cease, will inevitably occasion a gangrene. Thus a mere compress preventing the course of the blood, as effectually causes a mortification as any indisposition in the fluids or vessels.

It frequently happens in old age, that the arteries of the lower extremities ossify; which destroying their elasticity, must in consequence produce a gangrene in the toes first, and afterwards in the limb nearly as high as where the ossification terminates; so that in mortifications arising from this cause, we at once see why amputation, during their increase, is of so little service, unless performed above the ossification; but we have no way to judge where the ossification ends, but by the inference we make from the gangrene's stopping: Hence we may learn the propriety of our modern practice in this case.

If by any accident the limb has been injured to that violent degree as to begin to mortify, it will be no more fit to operate here till it stops, than in the other instance; because all parts that are mortified have had the disposition to become so, before the effect is produced: and cutting off a limb, half an inch above the absolute dead skin, is generally leaving a part behind, with the seeds of a mortification in it; so, unless we can be sure the vessels are not affected in the place of amputation, which will be hard to know but from the consequence, the operation will be useless.

Sometimes the fluids of the body are so vitiated, as to lose their proper nutritious qualities: and the limb becomes gangrened, not from any alteration in its vessels, but chiefly from its situation, which being at a great distance from the heart, will be more prone to feel the ill effects of a bad blood than any other part, as the circulation is more languid in the extremities; and it seems not very improbable, that in some dispositions of the blood, a mortification may also be a kind of critical discharge. When therefore a gangrene arising from either of these causes, is running on, amputation above it will for the most part be useless, since it is only removing one degree of the effects of the bad juices, and leaving them in the same state to produce the like mischief in other parts. Thus we see, after amputations on this account, the gangrene sometimes fall on the bowels, or the other extremities: from which observation we may conclude it not safe to amputate, till the fluids are altered; and this alteration will presently discover itself by the stopping of the mortification.

Gunshot wounds, compound fractures, and all sudden accidents requiring amputation, are attended with the best success if immediately performed. Disorders of the joints, ulcers of long standing, and all scrophulous tumours, do sometimes return on other parts after the operation. When a leg is to be amputated, the manner of doing it is this.

Lay your patient on a table two feet six inches high, which is much better than a low seat, both for securing him steady, and giving yourself the advantage of operating without stooping, which is not only painful, but inconvenient in the other situation. While one of the assistants holds the leg, you must roll a slip of fine rag half an inch broad, three or four times round it, about four or five inches below the inferior extremity of the *patella*: This being pinned on, is to serve as a guide for the knife, which without it perhaps would not be directed so dexterously: The manner of rolling has always been perpendicular to the length of the leg; but having sometimes observed, that though the amputation at first be even, yet afterwards the *gastrocnemius* muscle contracting, draws back the inferior part of the stump more strongly than the other muscles can do the rest of it; in order to preserve the regularity of the cicatrix, allow for this excess of contraction, and make the circular incision in such a manner that the part of the wound

wound which is on the calf of the leg is a little farther from the ham than that on the ſhin is from the middle of the *patella*.

In the mean time, one of your aſſiſtants muſt carry a ſtrong ligature round the thigh, about three or four inches above the *patella*, which paſſing through a couple of ſlits in a ſquare piece of leather, he muſt twiſt with a tourniquet, till the artery is ſufficiently compreſſed, to prevent any great effuſion of blood; and to do it more effectually, he may lay a bolſter of tow or linen under the ligature, upon that part where the artery creeps. It will alſo be a little more eaſy to the patient, to carry a compreſs of linen three or four times double, round the thigh, on that part where the ligature is applied, in order to prevent it from cutting the ſkin.

The courſe of the blood being ſtooped, you muſt begin your inciſion juſt below the linen roller, on the under part of the limb, bringing your knife towards you, which at one ſweep may cut more than the ſemicircle; then beginning your ſecond wound on the upper part, it muſt be continued from the one extremity to the other of the firſt wound, making them but one line. Theſe inciſions muſt be made quite through the *membrana adipoſa*, as far as the muſcles; then taking off the linen roller, and an aſſiſtant drawing back the ſkin as far as it will go, you make your wound from the edges of it when drawn back, through the fleſh to the bone, in the ſame manner as you did through the ſkin. Before you ſaw the bones, you muſt cut the ligament between them, with the point of your knife; and the aſſiſtant who holds the leg while it is ſawing, muſt obſerve not to lift it upwards, which would clog the inſtrument; and at the ſame time, not to let it drop, leſt the weight of the limb ſhould fracture the bone, before it is quite ſawed thro'.

In amputating below the knee, it is of advantage to ſtand on the inſide of the leg; becauſe the *tibia* and *fibula* lie in a poſition to be ſawed at the ſame time, if the inſtrument be applied externally: whereas, if we lay it on the inſide of the leg, the *tibia* will be divided firſt, and the *fibula* afterwards; which not only lengthens the operation, but is alſo apt to ſplinter the *fibula* when it is almoſt ſawed thro', unleſs the aſſiſtant be very careful in ſupporting it.

When the leg is taken off, the next regard is to be had to the ſtopping the blood; which muſt be effectually done before the patient is put to bed, or there will be great danger of bleeding again, when the fever is excited, and the veſſels of the ſtump dilated, both which happen a very little while after the operation. There is no method for this purpoſe ſo ſecure, as taking up the extremities of the veſſels with a needle and ligature in the following manner. As ſoon as the amputation is performed, the aſſiſtant muſt looſen the tourniquet for a moment, upon which the orifices of the arteries will appear by the iſſue of the blood. The operator having then fixed his eye upon one of the largeſt veſſels, paſſes a crooked needle through the fleſh, a little more than a quarter of an inch above the orifice, and about the ſame depth, in ſuch a direction as to make nearly one third of a circle round the veſſel: then withdrawing the needle, he a ſecond time paſſes it into the fleſh and out again, in the ſame manner and about the ſame diſtance below the orifice of the veſſel. By this means, the thread will almoſt encompaſs the veſſel, and when it is tied (which ſhould be done by the ſurgeon's knot) will neceſſarily incloſe it within the ſtricture. All the conſiderable arteries are to be taken up in the ſame manner; that is, the tourniquet is to be looſened in order to diſcover the veſſel, and then the needle is to be paſſed round. This is a much better way than uſing the artery forceps, where the veſſels are apt to ſlip away out of the ligature: and as to ſtyptick applications, their want of ſafety is ſo well known, that the uſe of them, in hæmorrhages from large veſſels, is almoſt univerſally rejected; though it is thought by ſeveral ſurgeons who have experienced the virtue of agaric, that it will be found to be a more powerful aſtringent than any hitherto diſcovered.

It ſometimes happens in a large ſtump, that ten or more veſſels require tying; which done, you muſt apply looſe dry lint to the wound; or in caſe the ſmall veſſels bleed plentifully, you may throw a handful of flour amongſt the lint, which will contribute to the more effectual ſtopping up their orifices. Before you lay on the pledgit, you muſt bind the ſtump, and begin to roll from the lower part of the thigh down to the extremity of the ſtump. The uſe of this roller is to keep the ſkin forwards, which, notwithſtanding the ſteps already taken to prevent its falling back, would in ſome meaſure do ſo, unleſs ſuſtained in this manner. The dreſſing may be ſecured by the croſs cloth and gentle bandage; and the method of treating the wound may be learnt from what has been ſaid with reſpect to recent inciſed wounds.

In amputating the thigh, the firſt inciſion is to be made a little more than two inches above the middle of the *patella*. After the operation, a roller ſhould be carried round the body, and down the thigh, to ſupport the ſkin and fleſh: this is alſo the moſt proper bandage, as abſceſſes will ſometimes form in the upper part of the thigh, which cannot diſcharge themſelves ſo conveniently with any other, it being almoſt impracticable to roll above the abſceſs, unleſs we begin from the body.

The amputation of the arm or cubit differs ſo little from the foregoing operations, that it will be but a repetition to deſcribe it. However, it muſt be laid down as a rule, to preſerve as much of the limb as poſſible, and, in all amputations of the upper limbs, to place your patient in a chair.

The amputation of the fingers and toes is better performed in their articulation, than by any of the other methods: for this purpoſe, a ſtraight knife muſt be uſed, and the inciſion of the ſkin be made not exactly upon the joint, but a little towards the extremity of the fingers, that more of it may be preſerved for the eaſier healing afterwards: it will alſo facilitate the ſeparation in the joint, when you cut the finger from the *metacarpal* bone, to make two ſmall longitudinal inciſions on each ſide of it firſt. In theſe amputations, there is generally a veſſel or two that require tying, and which often prove troubleſome when the ligature is omitted.

It may happen that the bones of the toes, and part only of the *metatarſal* bones, are carious; in which caſe, the leg need not be cut off, but only ſo much of the foot as is diſordered: a ſmall ſpring-ſaw is better to divide with here, than a large one. When this operation is performed, the heel and remainder of the foot will be of great ſervice, and the wound heal up ſafely.

Explanation of Fig. 7. Plate CLVIII.

A. The figure of the amputating knife. The length of the blade and handle ſhould be about thirteen inches.

B,

B, The figure of the saw used in amputating the limbs. The length of the handle and saw should be about seventeen inches.

Of LUXATIONS.

A Bone is said to be luxated or dislocated, when it is moved out of its place or articulation, so as to impede its proper motion and office.

Luxation *of the* Nose.

It sometimes happens, that the bones of the nose are separated from each other, or distorted out of their natural places, by some violent blow or fall. When such an accident happens, it is several ways discovered: as, (1.) By the sight, when we behold the deformed position of the nose; or, (2.) By feeling; or lastly, (3.) By the ear, when perceive with what difficulty the patient draws his breath through his nostrils.

When this case happens, the patient is to be speedily placed in a high chair, that an assistant may stand behind and hold his head firm, in a proper posture: the surgeon is then to introduce with one hand, a thick probe, a goose-quill, or little stick shaped for the purpose, up the nostril internally, by which means the depressed parts of the nose may be thrust into their places: in the mean time he applies his other hand externally, to guide and direct the parts which are moved from within: this being done, there is scarce any thing else required but to let a bit of sticking plaister lie upon the nose at the same time.

Of a Dislocation *of the* Lower Jaw.

The lower jaw is indeed seldom luxated, because it is held so firm by strong ligaments and muscles, by whose assistance it is retained in two sinuses in the basis of the *cranium*: but when it is by accident forced out from thence, it may chance to be on one side only, or else on both, it being then thrust directly forwards: and this happens most frequently from opening the mouth too wide in yawning; though it has sometimes been occasioned by a violent blow or fall. If it be luxated on both sides, the chin will incline downward, and the jaw will be thrust very forward: but if only on one side, the chin will be inclined toward the opposite side; the elapsed little head of the jaw not being capable of dislocation but foreward and inward; for the processes of the bones of the *cranium* prevent the jaw from being dislocated backwards.

The lower jaw is chiefly known to be luxated on one side, when the chin is distorted on the opposite side: for that part to which the chin inclines, is the sound; but that from whence it recedes, is the luxated one: the mouth in this case gapes wider than usual, so that the patient cannot shut it, nor eat with his teath; the lower range of teeth being projected beyond, and on one side the upper: but when the jaw is luxated on both sides, then the mouth not only gapes wide and open, but the chin also hangs down, and is thrown directly forwards; so that the patient cannot shut his mouth, speak distinctly, or even swallow any thing without much difficulty.

When the jaw is out only on one side, and the case recent, the cure is usually not so very difficult; but when both heads are dislocated, and not presently restored to their places, it always occasions the worst of symptoms, as pains, inflammations, convulsions, fevers, vomitings, and at length death itself.

When this kind of luxation happens, the patient is to be directly seated on a low stool, so that an assistant may hold his head firm back against his breast. Then the surgeon is to thrust his two thumbs as far back into the patient's mouth as he well can; but they are first wrapped round in a handkerchief, to prevent them from slipping or being hurt; and his other fingers are to be applied to the jaw externally: when he has got firm hold of the jaw, it is to be strongly pressed, first downwards, then backwards, and lastly upwards, but so as that they may be all done in one instant; by which means the elapsed heads of the jaw may be very easily shoved into their former cavities.

If the jaw be out on one side only, every thing must be done in the same manner: but the luxated side of the jaw must be forced more strongly downward and backward than the sound one.

Of Luxations *of the* Head *and* Spine.

The luxations which happen in the *spine* and *vertebræ* of the back are generally imperfect ones. For it appears from an accurate consideration of the structure and articulation of these bones, that none of the *vertebræ* can be entirely displaced without being fractured, and also compressing or wounding the spinal marrow, which must produce danger of instant death. Even the imperfect luxations of these bones are very dangerous: which happen either between the two superior *vertebræ* of the neck and the head, or else between the rest of the *vertebræ*, when they are forced from each other.

Such as have a luxation between the head and upper *vertebra*, seldom escape being carried off by a speedy and sudden death: for in this case the tender *medulla* which joins immediately with the brain, and is lodged in the spine, the brain itself, and the nerves which arise beneath the *occiput*, are too much distended, compressed, or lacerated; the two condyloide processes of the *occiput* usually slip out of their glenoide sinus's in the first *vertebræ* of the neck, when a person falls headlong from a high place, from off a ladder, from on horseback, or when he receives a violent blow upon his neck: they dying very suddenly in this case, are vulgarly said to have *broke their neck*, though there is generally no more than a luxation: yet it sometimes happens that the *vertebræ* of the neck are really fractured. If life should remain after such a luxation, which very rarely happens, the patient's head is commonly distorted with his chin close down to his breast, so that he can neither swallow any thing, nor speak, nor even move any part that is below his neck: therefore, if speedy assistance be not had, death ensues, from the compressure or hurt of the *medulla*.

But to repulse this unwelcome messenger, the patient is to be immediately laid flat upon the ground or floor: then the surgeon kneeling down with his knees against the patient's shoulders, is to bring them together so as to contain the patient's neck between them: this done, he quickly lays hold of the patient's head with both his hands, and strongly pulling or extending it, he gently moves it from one side to the other; till he finds, by a noise, the natural posture of the neck, and the remission of the symptoms, that the dislocation is properly reduced: by this method the surgeon retains the patient firm between his knees, and per-

performs the extenſion and reduction between his hands.

It will be proper, in order to prevent a tumor, and reſtore the ſtretched ligaments of the neck to their former vigour, to bathe it with *aq. Hungar. ſp. vin. campb.* or ſome other ſtrengthening ſpirit applied warm, as alſo compreſſes dipped in the ſame: the patient ſhould bleed, and reſt gently for ſome days, till the neck be found ſufficiently ſtrong and well.

With reſpect to the reſt of the *vertebræ* of the back, they are ſeldom moved quite out of their places, unleſs they are fractured, they being retained, for the greateſt part, by adhering to the adjacent ligaments and muſcles: therefore the luxations which happen among them are uſually imperfect; no more being diſplaced than their two upper or lower proceſſes, and they often but on one ſide; and this happens ſometimes to one of the ſpinal *vertebræ*, and ſometimes to more. But it is here to be briefly obſerved, that it is uſual to include among the number of luxated *vertebræ*, that which is ſound and firm, but intercepted by others which are not ſo: thus whenever the upper *vertebræ* of the loins from the laſt of the back, and lowermoſt *vertebræ* of the loins next the *os ſacrum*, are luxated, we commonly ſay and reckon there are five *vertebræ* out of their places; when, ſtrictly ſpeaking, only the two outermoſt or the uppermoſt and lowermoſt of thoſe *vertebræ* are diſturbed, the three middle ones retaining their natural ſituation and connection.

The ſigns common to luxations in the *ſpina dorſi* are chiefly the following: the back itſelf is found to be crooked or unequal, after the external violence has been inflicted; the patient can neither ſtand nor walk, and his whole body ſeems to be paralytic; the parts which are beneath the luxated *vertebræ* are nearly without all ſenſe and motion; the excrements and urine cannot be diſcharged, or elſe they are ſometimes emitted involuntarily; the lower extremities grow dead by degrees; and, at length, death itſelf follows: but theſe ſymptoms vary in proportion to the degree of violence in the luxation.

Luxations of the ſpinal *vertebræ* are very difficult to reduce. The following ſeems to be the moſt ſuitable method of reducing luxations of the *vertebræ*: when the *apophyſes* of the *vertebræ* are diſlocated on both ſides, the patient is to be laid leaning upon his belly over a caſk, drum, or ſome other gibbous body; then two aſſiſtants are ſtrongly to preſs down both the ends of the luxated ſpine, on each ſide; by which means the bones of the ſpine will be ſet free from each other, lifted or puſhed up in the form of an arch, and ſo gradually extended. This done, the ſurgeon preſſes down the luxated *vertebræ*, and at the ſame time nimbly puſhes the ſuperior part of the body upwards: and by this means the luxated *vertebræ* are ſometimes commodiouſly reduced into their right places; but, if ſucceſs ſhould not attend the firſt time, the method ſhould be repeated two or three times more.

It ſeems proper, after the *vertebræ* are reduced, to bathe the ſpine with *ſp. vin* or to lay on compreſſes dipped in *ſp. vin. campb.* Afterwards the patient is to be laid in a ſoft and even bed; bleeding, and bathing the weak parts with ſtrengthening ſpirits, are to be uſed as there may be occaſion.

Of Luxations *of the* Os Coccyx, and Ribs.

The *os coccyx* may be thruſt inwards by a violent fall or blow, and it is often puſhed outwards in hard birth. When this happens, it is uſually attended with violent pain and inflammation about the lower part of the ſpine, abſceſſes form in the *inteſtinum rectum*, and the *fæces* are conſtipated or ſuppreſſed. To diſcover the luxation of this bone the more readily, we have recourſe to the uſe of our hands and eyes, as well as to the knowledge of the forementioned ſymptoms: nor is the replacing this bone very difficult, if attempted by a careful and expert ſurgeon; for if it be thruſt outwards, it muſt be depreſſed into its right place by the thumb, after which may be applied compreſſes dipped in warm wine, or its ſpirit, made broad above, and narrow below, to fill up the poſterior *ſinus* of the *nates*; and theſe may be held on by the T bandage; but that part of this bandage which comes between the thighs ſhould be ſlit, and placed ſo that the patient may go to ſtool without undoing the bandage, and to prevent the bone from being by that means diſplaced again.

When the *os coccyx* happens to be luxated inwards, the firſt finger is to be introduced into the *anus*. After it has had its nail cut and been dipped in oil, it muſt be thruſt as far as poſſible, that it may the more readily drive out the depreſſed bone; the other fingers being applied externally, are to conduct the bone into its right poſture: when this has been done, it will be proper for the patient to reſt ſome time upon the bed; and when he ſits up, it ſhould be in a chair with a hole in its bottom, leſt the affected part ſhould be otherwiſe compreſſed or diſturbed.

The ribs are indeed ſometimes, though but ſeldom, diſlocated; for upon the aſſault of ſome external violence, it is not uncommon for them to be diſplaced either upwards, downwards, inwards, or outwards. They cannot be eaſily luxated outwards, becauſe prevented by the vertebral proceſſes, and reſiſted by very thick and ſtrong muſcles: but when they are drove into the cavity of the *thorax*, they not only lacerate the *pleura*, but do generally great injury to the contained parts; in conſequence whereof ariſe moſt ſharp pains, inflammations, difficulty of breathing, cough, ulcers, immobility, and many other dangerous ſymptoms of the like nature.

When the rib is diſlocated either upwards or downwards, in order to replace it conveniently, the patient is to be laid on his belly upon a table, and the ſurgeon muſt ſtrive to reduce the luxated rib into its right place with his hands; or, the arm of the diſordered ſide may be ſuſpended over a gate or ladder, and while the ribs are thus ſtretched up from each other, the heads of ſuch as are luxated may be puſhed into their former ſeat.

But thoſe luxations wherein the heads of the ribs are forced into the *thorax*, are generally found to be much the moſt difficult to reduce; ſince neither the hand, nor any other inſtrument, can be applied internally to direct the luxated heads of the ribs: in this caſe it ſeems proper to lay the patient on his belly over ſome gibbous or cylindric body, and to move the fore part of the rib inwards towards the back, ſhaking it ſometimes; for thus generally the head of the luxated rib ſlips into its former place: but if this method of cure will avail nothing, and the deplorable condition of the patient requires ſpeedy help, we have no remedy left but inciſion, and endeavouring to replace the luxated head of the rib with the fingers, plyers, or little hooks. In the mean time, where the ſymptoms are not very urgent, and the heads of the ribs but little diſplaced, it is adviſeable neither to cut the fleſh, nor violently force the ribs; becauſe

cause there are several instances where the luxated ribs have retained their dislocated stations without any hurt: but above all, care must be taken to lay on a compress dipped in warm *Sp. Vin.* or *Sp. Vin. Camph.*

The clavicles may be dislocated either from the top of the *sternum*, or *processus acromion* of the *scapula*, by some external violence, as a fall, blow, the lifting some great weight, or the like.

Of a LUXATION *of the* HUMERUS.

THE *humerus*, from the length and laxity of its ligaments, the largeness of its motion, and the shallowness of the cavity in the *scapula*, into which it is articulated, is thereby rendered of all bones the most subject to be luxated. The head of this bone may often be dislocated under the arm-pit, sometimes forwards, sometimes backwards, and even below the *spacula*; but seldom perpendicularly downwards, and never directly upwards unless the *acromion* and *coracoide* processes of the *scapula* should chance to be fractured at the same time: besides, as long as the strong *deltoide* and *bicipital* muscles of the *humerus* remain entire, they greatly resist and keep down the *humerus* from being luxated upwards.

When the *humerus is luxated downwards*, (1.) There suddenly appears a cavity, and upon pressing with the fingers you will perceive a *sinus*; but under the arm there must be a tumour, because the head of the bone is thrust there. (2.) The *processus acromion* will seem to stick out further than usual, because of the adjacent *sinus*. (3.) The The luxated arm will be longer than the other, and it cannot be lifted up towards the head without violent pain, and sometimes it cannot be lifted up at all, or even extended. But when the *humerus is luxated forwards* as well as downwards, there will be observed the same *sinus* under the *processus acromion* as before, and a tumour will appear from the head of the *humerus* projecting towards the breast, under the *axilla*: the arm itself also cannot be moved without exciting the most acute pain. Lastly, When *the humerus is luxated backwards*, the *cubitus* is thrown forwards towards the *præcordia*, and the head of the bone makes a protuberance in the shoulder; the arm itself cannot be bent nor extended, nor even pulled outwards from the breast, without occasioning the most violent pains: but no luxation of this limb is attended with such dangerous symptoms, as when it is dislocated forwards or inwards; because the luxated head of the *humerus* cannot avoid injuring the large arteries and nerves of the arm; in consequence of which, various symptoms will arise.

As soon therefore as the luxation is discovered in the *humerus*, the safest way will be to seat the patient on the floor, or on a low stool. Two strong assistants are to be placed on each side the patient: one of which should secure his body, and, if possible, the *scapula* too, that it may not give way to the extension; while the other lays firm hold of the luxated arm with both his hands, a little above the *cubitus*, gradually and strongly extending it. But before that extension be made, the surgeon himself should have a large napkin, of a sufficient length, tied at the ends, and hung about his neck so that the knot may be behind; but the other part of the napkin must hang over his breast: then the patient's arm must be put through the napkin up to the shoulder, and the surgeon at the same time lays hold of the head of the *humerus* with both his hands: this done, he orders the assistant to extend the limb sufficiently, and in the mean time he himself elevates the head of the patient's *humerus* by the napkin about his neck, directing it with his hands, till it slip into its former cavity in the *scapula*.

Of a LUXATION *of the* CUBITUS.

THE *cubitus*, consisting of two bones, the *ulna* and the *radius*, is articulated by *ginglymus*. The connection of these bones is such, that the *ulna* or *cubitus*, as being the largest bone, and seated in the inferior part of the arm, does of itself perform the whole flection and extension of the arm; yet it cannot perform that motion without carrying the *radius* along with it; so that the *radius* always follows the *ulna* in flection and extension: but, on the other hand, the *radius* may be turned along with the hand both inward and outward, without at all moving or bending the *ulna*; as when the pronation and supination of the hand is made thereby. Both these bones of the *cubitus* are so articulated with the lower head of the *os humeri*, that large protuberances are received into deep cavities or grooves, and the whole invested and fastened with exceeding strong ligaments; so that notwithstanding the *cubitus* may be luxated in all four directions, outward, inward, forward, and backward, yet it is but seldom that it suffers a perfect or entire dislocation, unless the upper part of the *ulna*, called *olecranon*, be broken, or the ligaments of the *cubitus* much weakened, by some very great external violence.

If the *cubitus be luxated backward*, which is the most frequent of all others, then the arm becomes crooked and shorter, and it cannot be extended. In the inward part of the bend of the arm, the head of the *humerus* may be observed to stick out; in the back part of the same, the head of the *ulna* or *olecranon* will be protuberant, and between both bones will appear a *sinus* or cavity. But it very seldom happens that the *cubitus is luxated forward*, from the largeness of the *olecranon*: unless that be fractured at the same time. But if this should happen, the head of the *humerus* will stick out behind, and that of the *cubitus* before; and there will be a cavity more or less in proportion to the degree of the luxation. When the *cubitus is luxated externally*, the protuberance appears on the outside of the *cubitus*; and the contrary when luxated inwards. To conclude, unless the ligaments and muscles of the *cubitus* are quite broken in two, it is so far from being capable of suffering a perfect dislocation, that no more can happen to it than a subluxation, *i. e.* it can but recede but a very little way out of its right place: but whatever of this kind happens, the case may be very easily understood, by feeling and inspecting the part, if there be no tumor; but if the joint be much swelled, it is very difficult to be discovered.

Be the luxation, however, more or less, the patient must be speedily placed in a chair; and both parts of the limb, the *humerus* and the *cubitus*, must be extended in opposite directions by two stout assistants, till the muscles are found pretty tight, with a free space between the bones: then the luxated bone must be replaced with the surgeon's bare hands, or together with bandages; and that the processes may fall into their *sinuses*, the *cubitus* must be afterwards suddenly bent. But if the tendons and ligaments are so violently strained, that they can scarce perform their office; it will not be improper to anoint them well with emollient oils, ointments, or the fat of animals, or to apply emollient fomentations and cataplasms.

As

As soon as the reduction has been by these means effected, the articulation must be bound up with a proper bandage, and the arm is to be afterwards suspended in a napkin or sling about the neck: but care must be taken, that the bandage be not suffered to be on too long, nor the arm to be kept all the time still, without some gentle motion.

On Luxations *of the* Hand, Carpus, Metacarpus, *and* Fingers.

Notwithstanding the hand is very accurately connected to the two preceding bones, and particularly to the *radius*, by means of the *carpus* and strong ligaments, yet it sometimes suffers luxation in all four directions; but it is generally not so easy to be luxated on either side, as forward or backward, because of the two processes of the *radius* and *ulna*, which guard it on each side. The hand is said to be *luxated forwards* or *inwards*, when it recedes from the muscles which bend the fingers; to be *luxated backward*, when it departs from the muscles which extend the fingers: much also in the same manner, the hand is judged to be *luxated outward*, when the *carpus* makes a tumor near the thumb, and a cavity near the little finger; to be *luxated inward*, when the contrary happens.

It seems to be the safest way immediately to reduce what is displaced; and that this may succeed the better, two things are to be chiefly regarded: (1.) That the luxated hand be sufficiently extended by two assistants, one of which is to lay hold of the hand, and the other of the *humerus*, pulling in opposite directions: (2.) That the part of the extended hand, where the *sinus* is, be placed on a table, or some other flat body, that whatever sticks up may be depressed: by which method the hand, in whatever part luxated, may be very readily reduced into its natural seat.

It also sometimes happens, that one or two of the eight little bones of the *carpus* are luxated and distorted from their natural seat by some external violence. When this happens, there will be perceived a tumor in one part, and a cavity in another, which may be also felt by the fingers; besides, violent pains will be felt by the patient. For the rest, as this kind of luxation is very easily discovered, partly by the sight, and partly also by feeling; so, when it is recent, it is almost as readily cured, letting the hand be extended in the manner we before proposed, and the dislocated bone be afterwards forced into its place.

The four small bones, which are found in the *metacarpus* or palm of the hand, may be sometimes luxated from the *carpus* itself, to which their upper parts are connected; which usually happens from some external violence. The two bones which are seated in the middle between the two other external ones, cannot be dislocated to either side; as the two external ones which sustain the first and little fingers cannot be luxated inwardly, but are more easily driven outward: though each of them may be luxated on the fore or back part of the hand. But which ever of these happens, the particular disorder may be discovered and examined by feeling and inspecting, and the cure may be carried on in altogether the same method which we directed before.

Lastly, The bones of the fingers, to which we join those of the thumbs, are liable to luxation at each of their articulations, and that in several directions. But these accidents, if recent, are both very easy to discover and cure: for the ligaments being not very robust, the fat and muscles thin, and the *sinuses* of the articulations shallow, render the extension very easy, and the reduction of them into their former places may be done very readily. While one hand of the surgeon extends the finger, he strives with his other to replace the bones in their natural seat.

Of a Luxation *of the* Thigh.

Very rare is it that the head of the thigh-bone is displaced out of its *acetabulum*; though formerly it was supposed to be pretty frequent, physicians taking a fracture thereof for a luxation, the reason whereof may be taken from the articulation itself: (1.) How very deep is the *sinus*, called by the ancients *sinus coxæ*, and by the moderns *acetabulum*, into which the head of the thigh-bone is received. (2.) With what a broad concave cartilage is almost the whole head of that bone covered. (3.) How strong are the ligaments with which it is fastened. (4.) How greatly it is defended with exceeding stout and thick muscles. (5.) But how very brittle is the neck of this bone beyond any other part thereof: from all which it appears, that the neck must be far more frequently and easily broke, especially in adults, than its head dislocated: and though something of this kind may sometimes happen, so as to make the head of the thigh-bone slip out of its *acetabulum*; yet that generally proceeds more from internal than external causes: for we find it has been observed by very skilful physicians, that the ligaments of the thigh-bone, though very strong, may be by various causes, and particularly by a flux of humours, so relaxed and weakened, as to let the head of that bone slip spontaneously out of its *acetabulum*; so that it should seem no great wonder if the thigh should be sometimes luxated even while the patient lies in bed, without any external violence, so that when they rise, one leg appears longer or shorter than the other, and seems as if it were unhinged.

But this case does not happen so easy in robust adults, as in such as are more young and tender.

Whenever the said head of the thigh-bone is thrust out, it is almost always wholly displaced, so as to make a perfect luxation. The exact roundness of this head, with the great force of the circumjacent muscles, and the narrowness of the sides of the *acetabulum*, will not admit the bone to be dislocated a little way only; for as soon as the head of this bone is thrust up to the edge of the *acetabulum*, it must unavoidably either turn quite out, or else fall back again into its right place.

The thigh is usually luxated four ways; *upward*, *downward*, *backward*, and *forward*; but it is most frequently dislocated downwards and inwards, towards the large *foramen* in the *os pubis*: for besides that the cartilaginous defence on the lower part of the *acetabulum* is not so high as the rest, the *ligamentum rotundum* is found to give way more easily in that part than any other: and lastly, the adjacent muscles are found to be weakest in their resistance on this part, being insufficient to keep the head of this bone from slipping out; and then there is a certain eminence in this edge of the *acetabulum*, which keeps the head of the *os femoris* from falling back again into its right place: but if the head of this bone be displaced outwards, it generally slips upwards at the same time; it being scarce possible but the very strong muscles of the thigh must then draw the bone upwards, and then there is no eminence there, in the edge of the *acetabulum*, to resist the head of the bone in that passage; but should it at any time be luxated by an external

ternal force, there muſt certainly be a rupture of the round ligament.

When the thigh is diſlocated forwards and downwards, which is what uſually happens, the leg hangs ſtraddling outward, and is longer than the other; alſo the knee and foot turn outwards; the head of the bone itſelf will be felt near the lower part of the *inguen* and *os pubis*: ſometimes there is a ſuppreſſion of urine in this caſe; when ſome nerve, which communicates with the bladder, is violently compreſſed; in the buttock may be perceived a cavity, from the *trochanter major* and the reſt of the bone being diſplaced; and if the thigh-bone be not timely replaced into its *acetabulum*, the whole limb withers ſhortly afterwards; and this is the reaſon why the patient can bear little or no ſtreſs upon that limb, but muſt always incline and throw the weight of his body upon the other.

But if the thigh-bone be diſplaced backward, it is uſually drawn upward alſo at the ſame time: hence there will be perceived a cavity behind the *inguen*; but upon the haunch or buttock, a tumour; becauſe the head and *trochanter* of this bone will be thruſt there. The tumour in the haunch being thruſt upwards, the reſt of the limb will become ſhorter than the other, and the foot will ſeem to turn inwards; the heel will not touch the ground, and ſo the perſon will ſeem to ſtand upon his toes; and laſtly, the luxated limb may be bent with more eaſe than extended.

We do not without reaſon judge the thigh to be luxated, (1.) When we find the ligaments of the bone have been relaxed by ſome preceding congeſtion of humours, and when no external violence has been exerted upon it, eſpecially in young patients. (2.) When neither the ſymptoms, pain, tumour, or inflammation follow: and laſtly, (3.) When the whole limb may be bent and turned about at the *acetabulum* without any cruſhing of the bones, which is otherwiſe common in fractures. The contrary of theſe ſigns are ſtrong indications that a fracture is preſent; more particularly if the foot in grown perſons be ſhorter, from the injury of any external violence, and you hear a grating of the bones in moving the limb.

The luxated bone is always to be replaced in a method agreeable to the nature and direction of the diſlocation. When it is diſplaced forwards and downwards, the patient is to be laid flat upon his back on a table; then a linen napkin or ſtrong ſling is to be made faſt over the groin about the part affected, ſo that one end of the ſling may come over the belly, and the other over the *nates* and back, to be both tied together in a knot upon the ſpine of the *os ilium*, and afterwards faſtened to a hook fixed in ſome poſt, or held firm by ſome aſſiſtants; rather the firſt, if we uſe the polyſpaſton or pulley, to retain the patient's body firm from giving way in the extenſion; in like manner, at the bottom of the thigh, a little above the knee, there muſt be alſo faſtened another napkin, or ſling, with a compreſs between it and the thigh. Both the ſlings being drawn tight, the thigh is to be extended, not vehemently, but only ſo much as is ſufficient to draw the bone out of its ſinus, that it may be replaced into its *acetabulum* by the ſurgeon's hands; one hand is to preſs the head of the thigh-bone outward, while the other conducts the knee inwards; or, the reduction may be made by napkins, faſtened round the extremities of the thigh like ſlings, much as in a luxation of the humerus: which will be more likely to ſucceed if the knee be at the ſame time preſſed inwards by the hands. When the fore-recited means are not ſufficient to make the extenſion, it will be neceſſary to make uſe of the polyſpaſton or pulley. As ſoon as the thigh is found to be ſufficiently extended, the ſurgeon muſt take particular care to reſtore the luxated head of the thigh-bone with his hands from the *os pubis* into its former ſeat.

Whenever the thigh is luxated backward, the patient is to be placed flat on a table, with his face downward; and the thigh is to be extended in directly the ſame manner, but a little more ſtrongly than we juſt now propoſed; and the reduction is to be effected afterwards by the ſurgeon's hands, an aſſiſtant in the mean time extending the limb, and turning it inwards; by this means the head of the thigh-bone generally ſlips very readily again into its *acetabulum*.

Of a Luxation *of the* Patella *and* Knee, *or* Tibia *and* Fibula.

The *patella* is uſually luxated moſtly on the internal or external ſide of the joint; but whenever the knee is perfectly luxated, the *patella* can ſcarce avoid being diſplaced at the ſame time, becauſe of its ſtrong connection to the thigh and *tibia*.

The reduction of a luxated *patella* is uſually no very great difficulty, if the patient be laid flat on his back upon a table or bed, or if he be laid in that poſture upon an even floor, ſo as that the leg may be pulled out ſtrait by an aſſiſtant: for then the ſurgeon may firmly graſp the patella with his fingers, and afterwards preſs it ſtrongly into its right place; which may be alſo effected if the patient ſtands upright: when this is done, there remains nothing but carefully to bind up the diſordered part, and to let the patient reſt quietly for ſome days, ſometimes gently bending and extending his leg to prevent it from growing ſtiff, till the pains are gone off, and the limb has recovered its former ſtrength.

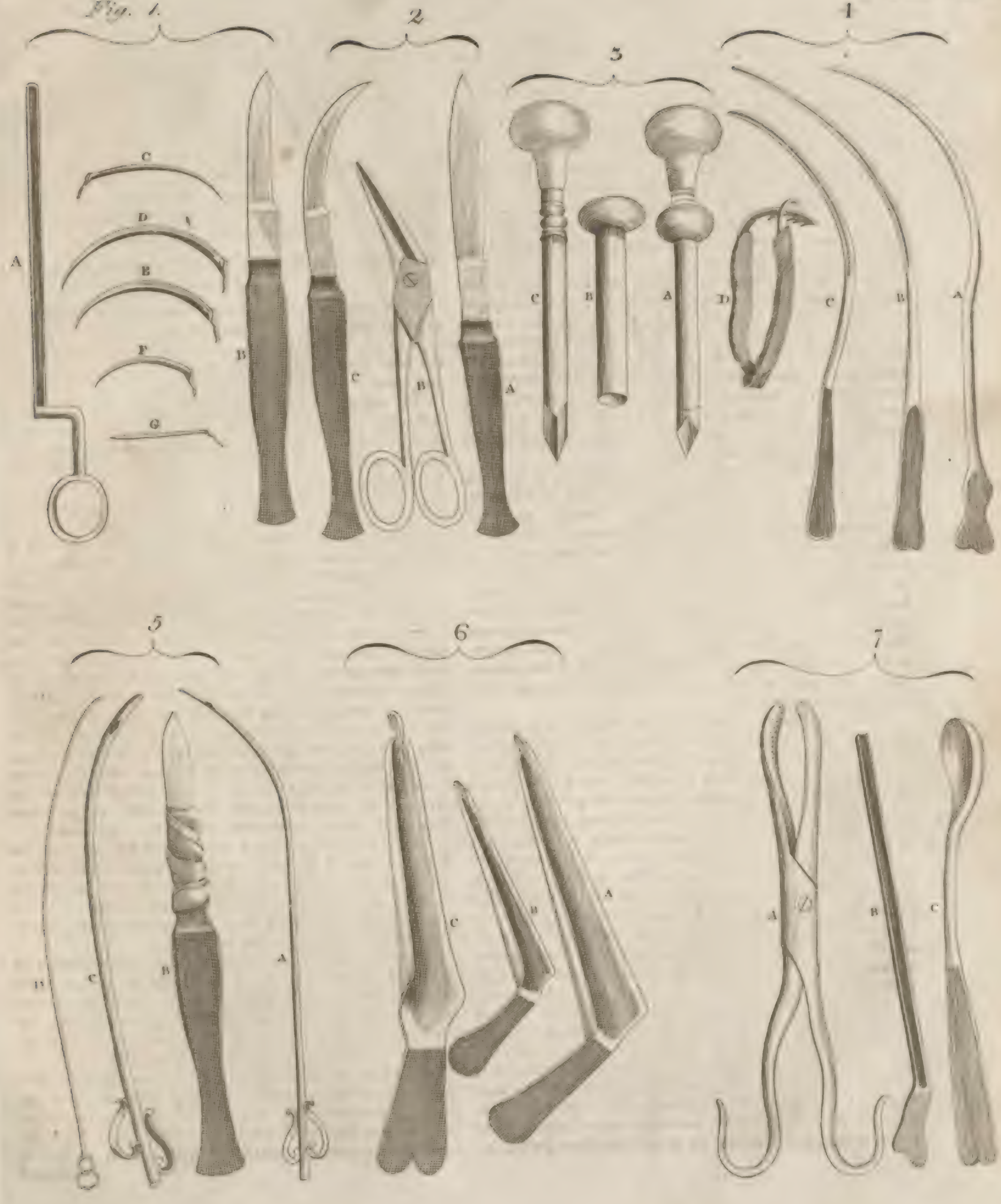
A luxation of the knee is properly ſo, when the *tibia* recedes from under the *femur*. The leg is ſometimes luxated from the baſis of the thigh-bone, either on the out or inſide, or backwards; ſeldom or never forwards, unleſs it be forced and driven very violently that way; becauſe forwards, the patella is bound againſt the articulation, by the very ſtrong tendons of the muſcles which extend the leg; nor is it eaſy for the bones of the leg to be wholly diſplaced from that of the thigh, ſo as to make a perfect luxation; by reaſon of the great ſtrength of the ligaments, and the two deep *ſinuſes* which receive the head of the thigh-bone.

As this kind of luxation is very eaſy to diſcover from the thin covering of the joint, with the tumors and cavities which follow; ſo, when it is diſcovered, it is as difficult to make a perfect cure thereof, without letting the bones join together; or leaving ſome ſtiffneſs in the knee; which firſt accident is uſually called an *anchyloſis*.

When the knee is but ſlightly luxated, the patient is to be ſeated on a bed, bench, or table, and one aſſiſtant holds the thigh firm above the knee, and the other extends the leg; but the ſurgeon in the mean time replaces the bones by his hands and ſlings if neceſſary, or puſhes it by the application of his knee into its natural place.

Sometimes the *fibula* is ſeparated by ſome external violence from the thigh-bone, and is then diſtorted either upward or downward: and this generally happens, when the foot has been luxated outward; therefore, when this is the caſe, there is need of extenſion. The bone is to be firſt

reſtored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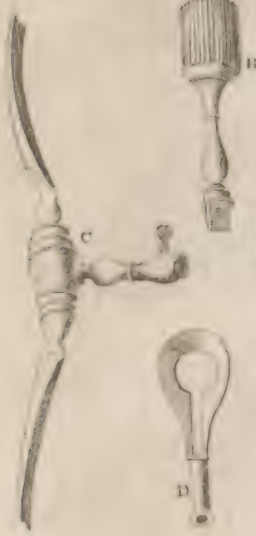

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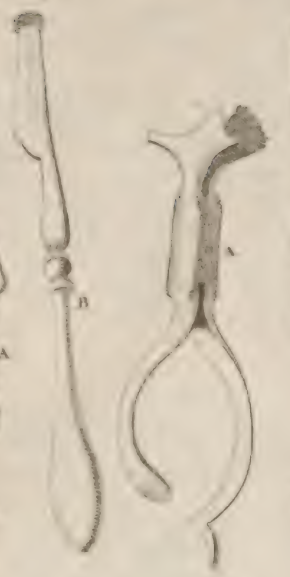

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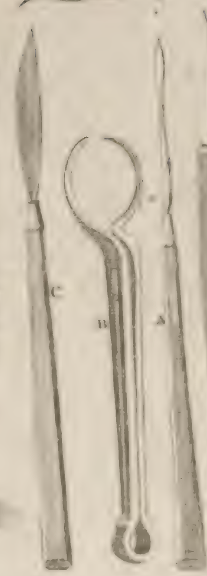

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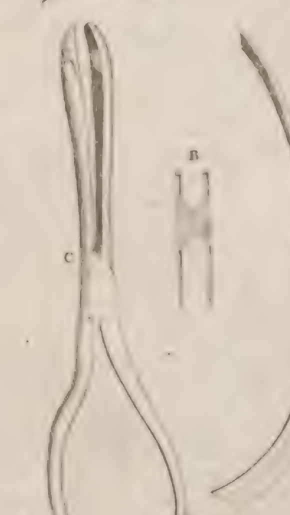

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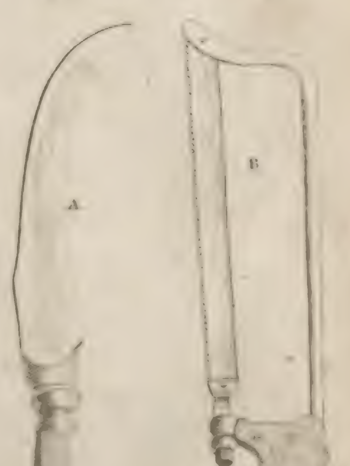


restored to its natural place, and then properly bound up.

Of a Luxation *of the* Foot *and* Ancle.

The ancle may be sometimes luxated either in jumping, running, or walking; and that in all four directions, inward, outward, backward, and forward. Which of these ways it happens to be luxated, may be discovered by the particular posture of the joint.

The ancle is more or less difficult to reduce, in proportion to the violence of the cause by which it is luxated. But the most ready way of reducing a luxation of the ancle is to place the patient upon a bed, seat, or table, letting the leg and foot be extended in opposite directions by two assistants, while the surgeon strives to reduce the ancle with his hands and fingers. When the foot is by this means once replaced, it is proper to bind it up carefully, after it has been well bathed with *oxycrate* and salt, advising the patient to keep to his bed a good whille, till the disorder and its symptoms quite leave him.

Sometimes it happens, that only the *os calcis* or *calcaneum* is luxated by some external force, and that either towards the internal or external side of the foot. Whichever way it happens, when there is pain and inequality of the member, that is, when it has a cavity in one part, and a tumour in another, there is strong reason to suppose a luxation: and as soon as it is discovered, the same method of cure is required with that before recited, keeping the limb quiet for some time afterwards.

Lastly, if any other bone in the foot, the *tarsus* or *metatarsus*, should happen to be luxated by some considerable external violence, the ligaments with the adjacent nerves and tendons are generally so affected as to excite not only most acute pains, but violent inflammations and convulsions; and even death itself has been observed to be the consequence, unless the bones were speedily replaced: it is therefore the safest way to reduce the luxations in these bones of the foot, by the method we before proposed for those of the hands, and that with the greatest expedition.

SURIANA, in botany, a genus of the decandria pentagynia class. The calix consists of six leaves; and the corolla of five petals; and there are five roundish seeds. There is but one species, a native of America.

URINAM, the capital of the Dutch settlements in Guiana, in South America: W. long. 56°, and N. lat. 6° 30′.

SURMOUNTED, in heraldry, is when one figure is laid over another. As the pile surmounted of a chevron in Plate CXLVII. fig. 17.

SURREPTITIOUS. See Subreptitious.

SURRY, a county of England, bounded by the river Thames, which separates it from Middlesex, on the north; by Kent, on the east; by Sussex, on the south; and by Berkshire, on the west; being thirty-four miles long, and twenty-one broad.

SURROGATE, in law, denotes a person that is substituted, or appointed in the room of another.

SURSOLID, in arithmetick and algebra, the fifth power, or fourth multiplication of any number or quantity considered as a root. See Arithmetick, and Algebra.

SURVEYING, the art or act of measuring land; that is, of taking the dimensions of any tract of ground, laying down the same in a map or draught, and finding the content or area thereof. See Geometry, p. 699.

SURVEYOR, a person who hath the oversight and care of considerable works, lands, or the like.

Surveyor likewise denotes a gauger; as also a person who surveys lands, and makes maps of them.

SURVIVOR, in law, signifies the longest liver of jointten nts, or of any two persons jointly interested in a thing.

SUS, in zoology, a genus of quadrupeds belonging to the order of belluæ. They have four converging fore-teeth in the upper jaw, and six prominent ones in the under jaw; there are two short dog-teeth in the upper jaw, and one longer and jutting out in the under jaw; the snout is truncated, prominent, and moveable. There are five species. The sus scrosa, or common sow, is a native of the southern parts of Europe. It feeds coarsely, digs up roots, *&c.* from the ground with its snout. It is a fat, sleepy, stupid, dirty animal, wallowing constantly in the mire. The sow brings forth a great number of young at a litter, and is therefore considered as a profitable animal. The flesh, however, is not reckoned to be of the most wholesome kind.

SUSDAL, a city of the province of Moscow, in Russia, one hundred miles north-east of Moscow.

SUSPENSION, or *Points of* Suspension, in mechanics, are those points in the axis or beam of a balance, wherein the weights are applied, or from which they are suspended. See Mechanics.

Suspension *of Arms*, in war, a short truce agreed on by both armies, in order to bury the dead, wait for fresh instructions, or the like.

Suspension, in Scots law. See Law, Tit. xxxii. 4.

SUSSEX, a county of England, bounded by Surrey and Kent on the north, by another part of Kent on the east, by the English channel on the south, and by Hampshire on the west: being sixty-five miles long, and twenty-nine broad.

SUTHERLAND, a shire of Scotland, bounded by Caithness on the north, by the German sea on the east, by Rossshire on the south, and by the Caledonian ocean on the west and north-west.

SUTTON GOLEFIELD, a market-town twenty miles north-west of Warwick.

SUTURE, in anatomy. See Anatomy, p. 152.

Suture, in surgery, a method of uniting the lips of wounds. See Surgery, p. 650.

SWABBER, an inferior officer on board ships of war, whose employment it is to see that the decks are kept neat and clean.

SWABIA, a circle of the German empire, bounded by Franconia and the palatinate of the Rhine on the north, by Bavaria on the east, by Switzerland and Tyrol on the south, and by the river Rhine, which separates it from Alsatia, on the west; being one hundred and thirty miles long, and one hundred and ten broad.

SWALE, a river of Yorkshire, which rising on the confines of Westmorland, runs south-east through Yorkshire, and falls into the Ouse.

SWALLOW, in ornithology. See Hirundo.

Swallow-wort, in botany. See Asclepias.

SWAN, in ornithology. See Anas.

SWEAT, a fenfible moifture iffuing out of the pores of the fkins of animals. See Perspiration.

SWEDEN, one of the moft northerly kingdoms of Europe, bounded by Norwegian Lapland on the north, by Ruffia on the eaft, by the Baltic fea on the fouth, and by Norway on the weft; being upwards of eight hundred miles from north to fouth, and five hundred from eaft to weft.

SWEEP, in the fea-language, is that part of the mould of a fhip, where fhe begins to compafs in at the rung-heads: alfo, when the hawfer is dragged along the bottom of the fea, to recover any thing that is funk, they call this action fweeping for it.

SWEET, in the wine-trade, denotes any vegetable juice, whether obtained by means of fugar, raifins, or other foreign or domeftic fruit, which is added to wines, with a defign to improve them.

SWERIN, a town of lower Saxony, in Germany, capital of the duchy of Mecklenburg, and fituated on the lake of Swerin: in E. long. 11° 30′, and N. lat. 54°.

SWERTIA, in botany, a genus of the pentandria digynia clafs. The corolla is rotated, and there are nectariferous pores at the bafes of the different laciniæ of the corolla; the capfule has one cell, and two valves. There are five fpecies, only one of them, *viz.* the perennis, or marfh gentian, a native of Britain.

SWIMMING, the art or act of fuftaining the body in water, and of moving therein; in which action the air-bladder and fins of fifhes bear a confiderable part.

Though a great deal depends on the motion of the mufcles of the feveral parts of the body, in the fwimming of the fifh; yet the tail, and thofe mufcles which move the lower part of the body to which it is affixed, are the great inftruments by which their fwift motions in the water are performed. The moving the tail, and that part of the body to which it adheres, backward and forward, or fideways any one way, throws the whole body of the fifh ftrongly the contrary way; and even in fwimming ftraight forward, the motion and direction are both greatly affifted by the vibrations of this part, as may be experienced in the motion of a boat, which, when impelled forward, may be firmly guided by means of an oar held out at its ftern, and moved in the water as occafion directs. The dorfal mufcles, and thofe of the lower part of the body between the anus and tail, are the principal that are ufed in the motion of this part, and thefe are therefore the moft ufeful to the fifh in fwimming. The mufcles of the belly feem to have their principal ufe in the contracting the belly and the air-bladder. They have been fuppofed of ufe to move the belly-fins; but there are too many of them for fuch a purpofe, and thefe fins have each its peculiar mufcle fully fufficient to the bufinefs. The ufe of the tail in fwimming is eafily feen, by cutting it off, and committing the fifh to the water without it, in which cafe it is a moft helplefs creature.

By the help of the tail they alfo turn about, by ftriking ftrongly with it on one fide, and keeping it bent, fo as to act like the rudder of a fhip. The fins, efpecially the pectoral ones, ferve to keep the fifh upright, as alfo to afcend and defcend.

Brutes fwim naturally; but men attain this art by practice and induftry. It confifts principally in ftriking alternately with the hands and feet; which, like oars, row a perfon forward: he muft keep his body a little oblique, that he may the more eafily erect his head, and keep his mouth above water.

SWINE, in zoology. See Sus.

SWINGLING, the beating of flax or hemp. See Flax.

SWITZ, the capital of one of the cantons of Switzerland, to which it gives name, fituated on the eaft fide of the lake Lucern, fixteen miles fouth-eaft of the city of Lucern: E. long. 8° 30′, and N. lat. 47°.

SWITZERLAND, or Swisserland, called Helvetia by the Romans, is furrounded by the territories of Germany, France, and Italy, being about two hundred and fixteen miles long, and upwards of one hundred miles broad.

SWORD, an offenfive weapon, worn at the fide, and ferving either to cut or ftab: its parts are the handle, guard, and blade; to which may be added the bow, fcabbard, pummel, *&c.*

Sword-fish. See Xiphias.

SYCAMORE-tree, in botany. See Acer.

SYCOPHANT, an appellation given by the ancient Athenians to thofe who informed of the exportation of figs, contrary to law; and hence it is ftill ufed in general for all informers, parafites, flatterers, cheats, *&c.*

SYLLABLE, in grammar, a part of a word, confifting of one or more letters, pronounced together.

SYLLABUS, in matters of literature, denotes a table of contents, or an index of the chief heads of a book or difcourfe.

SYLLOGISM, in logic, an argument or term of reafoning, confifting of three propofitions; the two firft of which are called premiffes, and the laft the conclufion. See Logic, p. 991.

SYMBOL, a fign or reprefentation of fomething moral, by the figures or properties of natural things.

Hence fymbols are of various kinds, as hieroglyphics, types, ænigmas, parables, fables, *&c.*

Among Chriftians, the term fymbol denotes the Apoftles creed.

SYMMETRY, the juft proportion of the feveral parts of any thing, fo as to compofe a beautiful whole.

SYMPATHETIC, fomething that acts, or is acted on, by fympathy: thus we fay, fympathetic difeafes, inks, powders, *&c.*

SYMPATHY, in medicine, denotes an indifpofition befalling one part of the body, through the defect or diforder of another; whether it be from the affluence of fome humour, or vapour fent from elfewhere; or from the want of the influence of fome matter neceffary to its action.

SYMPHONY, in mufick, properly denotes a confonance or concert of feveral founds agreeable to the ear, whether vocal or inftrumental, called alfo harmony.

SYMPHYSIS, in anatomy. See Anatomy, p. 148.

SYMPHYTUM, in botany, a genus of the pentandria monogynia clafs. The limbus of the corolla is tubular and fomewhat ventricofe, the fauces being clofed with fubulated radii. There are three fpecies, only one of them, *viz.* the officinale, or comfrey, a native of Britain. The root of the comfrey is a fine mucilage.

SYMPOSIARCH, in antiquity, the director, or manager of an entertainment. This office was fometimes performed by the perfon at whofe charge the entertainment was provided;

provided; ſometimes by another named by him; and at other times, eſpecially in entertainments provided at the common expence, he was elected by lot, or by the ſuffrages of the gueſts.

SYMPTOM, in medicine, any appearance in a diſeaſe, which ſerves to indicate or point out its cauſe, approach, duration, event, *&c.*

SYMPTOMATICAL, in medicine, is a term often uſed to denote the difference between the primary and ſecondary cauſes in diſeaſes: thus a fever from pain is ſaid to be ſymptomatical, becauſe it riſes from pain only.

SYNÆRESIS, contraction, in grammar, a figure whereby two ſyllables are united in one; as *vemens* for *vehemens.*

SYNAGOGUE, a particular aſſembly of Jews met to perform the offices of their religion. Alſo the place wherein they meet.

SYNALOEPHA, in grammar, a contraction of ſyllables, performed principally by ſuppreſſing ſome vowel or diphthong at the end of a word, on account of another vowel or diphthong at the beginning of the next. As *ill' ego*, for *ille ego*, &c.

SYNARTHROSIS, in anatomy. See ANATOMY, p. 148.

SYNCHONDROSIS, in anatomy. See ANATOMY, p. 148.

SYNCHRONISM, denotes the happening of ſeveral things in the ſame time.

SYNCOPATION, in muſick, denotes a ſtriking or beating of time, whereby the diſtinction of the ſeveral times or parts of the meaſure is interrupted.

SYNCOPE, FAINTING, in medicine, a deep and ſudden ſwooning, wherein the patient continues without any ſenſible heat, motion, ſenſe, or reſpiration, and is ſeized with a cold ſweat over the whole body, and all the parts turn pale and cold as if dead. See MEDICINE, p. 157.

SYNCOPE, in grammar, an eliſion or retrenchment of a letter or ſyllable out of the middle of a word, as *caldus* for *calidus.*

SYNDIC, in government and commerce, an officer in divers countries intruſted with the affairs of a city, or other community, who calls meetings, makes repreſentations and ſolicitations to the miniſtry, magiſtracy, *&c.* according to the exigency of the caſe.

SYNDROME, a word introduced into medicine by the empirics, who mean by it a concourſe of ſymptoms.

SYNECDOCHE, in rhetoric, a kind of trope, frequent among orators and poets. There are three kinds of ſynecdoches. By the firſt, a part is taken for the whole; as the point for the ſword, the roof for the houſe, the ſails for the ſhip, *&c.* By the ſecond, the whole is uſed for a part. By the third, the matter whereof the thing is made is uſed for the thing itſelf; as ſteel for ſword, ſilver for money, *&c.* To which may be added another kind, when the ſpecies is uſed for the genus, or the genus for the ſpecies.

SYNECDOCHE, in Greek and Latin grammar, is when the ablative of a part or an adjunct of a ſentence is changed into the accuſative.

SYNECPHONESIS, in grammar, a coalition whereby two ſyllables are pronounced as one.

SYNGENESIA, in botany. See BOTANY, p. 635.

SYNNEUROSIS, in anatomy. See ANATOMY, p. 148.

SYNOCHUS, or SYNOCHA, in medicine, a continual fever, without any remiſſion. See MEDICINE, p. 79.

SYNOD, in aſtronomy, a conjunction, or concourſe of two or more ſtars, or planets, in the ſame optical place of the heavens.

SYNOD, ſignifies alſo a meeting, or aſſembly of eccleſiaſtical perſons, concerning matters of religion.

SYNODALS, were pecuniary rents, commonly of two ſhillings, paid to the biſhop, or archdeacon, at the time of their Eaſter viſitation, by every pariſh prieſt.

SYNODICAL, ſomething belonging to a ſynod: thus ſynodical epiſtles are circular letters written by the ſynods to the abſent prelates and churches, or even thoſe general ones directed to all the faithful, to inform them of what had paſſed in the ſynod.

SYNOECIA, in Grecian antiquity, a feaſt celebrated at Athens, in memory of Theſeus's having united all the petty communities of Attica into one ſingle commonwealth, the ſeat whereof was Athens, where all the aſſemblies were to be held. This feaſt was dedicated to Minerva; and, according to the ſcholiaſt of Thucydides, it was held in the month Metagitnion.

SYNONYMOUS, is applied to a word or term that has the ſame import or ſignification with another.

SYNOVIA, in medicine, a term uſed by Parcelſus, and his ſchool, for the nutricious juice proper and peculiar to each part; thus they talk of the ſynovia of the joints, of the brain, *&c.*

SYNTAX, in grammar, the proper conſtruction, or due diſpoſition of the words of a language, into ſentences, or phraſes. See GRAMMAR.

SYNTEXIS, in medicine, an attenuation, or colliquation of the ſolids of the body, ſuch as frequently happens in atrophies, inflammations of the bowels.

SYNTHETIC, or SYNTHETICAL is, according to Dr. Shaw, a term given to that part of chemiſtry, which, after the analytical chemiſtry has taken bodies to pieces, or reduced them to their principles, can, from theſe ſeparated principles, either recompound the ſame body again, or, from the mixtures of the principles of one or more bodies in various manners, form a large ſet of new productions, which would have been unknown to the world but for this art: ſuch productions are brandy, ſoap, glaſs, and the like

SYNUSIASTS, a ſect of heretics, who maintained, that there was but one nature and one ſingle ſubſtance in Jeſus Chriſt.

SYRACUSE, a city and port-town of Sicily, in the province of Val de Noto, ſituated on a fine bay of the Mediterranean ſea, on the eaſt coaſt of the iſland: in E. long $15^{\circ} 5'$, N lat. $37^{\circ} 25'$.

SYRIA, a part of Aſiatic Turky, bounded by Natolia and Turcomania, on the north; by Diarbec or Meſopotamia on the eaſt; by Arabia and Paleſtine on the ſouth; and by the Levant-ſea on the weſt. The Turks divide Syria into three beglerbeglies, or vice-royalties, *viz.* thoſe of Aleppo, Tripoli, and Damaſcus, or Scham, the ſeats of the reſpective viceroys.

SYRINGA, in botany, a genus of the diandria monogynia claſs. The corolla conſiſts of four ſegments, and the capſule has two cells. There are two ſpecies, both natives of Perſia.

SYRINGE, a well known inſtrument, ſerving to imbibe or ſuck in a quantity of fluid, and to ſquirt or expel the ſame with violence.

A ſyringe is only a ſingle pump, and the water aſcends

in

in it on the fame principle as in the common fucking pump. See HYDROSTATICS, p. 808.

SYRUP, in pharmacy, a faturated folution of fugar, made in vegetable decoctions, or infufions.

SYSSARCOSIS, in anatomy. See ANATOMY, p. 148.

SYSTEM, in general, denotes an affemblage or chain of principles and conclufions, or the whole of any doctrine, the feveral parts whereof are bound together and follow or depend on each other; in which fenfe we fay, a fyftem of philofphy, a fyftem of divinity, *&c.*

SYSTOLE, in anatomy, the contraction of the heart, whereby the blood is drawn out of its ventricles into the arteries; the oppofite ftate to which is called the diaftole, or dilatation of the heart.

SYSTYLE, in architecture, that manner of placing columns where the fpace between the two fufts confift of two diameters, or four modules.

SYZYGY, in aftronomy, a term equally ufed for the conjunction and oppofition of a planet with the fun. See ASTRONOMY.

T.

TABAGO, one of the Caribbee iflands in the American ocean, one hundred and twenty miles fouth of Barbadoes: W. long. 59°, N. lat. 11° 30′.

TABARCA, an ifland on the coaft of Barbary, in Africa, fifty miles weft of Tunis: E. long. 8°, N. lat. 36° 30′.

TABASCO, the capital of a province of the fame name, fituated on the bay of Campeachy, at the mouth of the river tabafco, one hundred and fixty miles fouth-weft of Campeachy: W. long. 95°. N. lat. 18°.

TABBY, in commerce, a kind of rich filk which has undergone the operation of tabbying. See the next article.

TABBYING, the paffing a filk or ftuff under a calender, the rolls of which are made of iron or copper, varioufly engraven, which bearing unequally on the ftuff renders the furface thereof unequal, fo as to reflect the rays of light differently, making the reprefentation of waves thereon.

TABELLA, TABLET, in pharmacy, is much the fame with troches and lozenges, being a folid preparation formed into a little cake, or mafs, of different figures, intended to diffolve flowly, and generally made agreeable to the palate.

TABELLIO, in the Roman law, an officer or fcrivener, much the fame with our notaries-public, who are often called tabelliones in our ancient law-books.

TABERNACLE, among the Hebrews, a kind of building, in the form of a tent, fet up, by exprefs command of God, for the performance of religious worfhip, facrifices, *&c.* during the journeying of the Ifraelites in the wildernefs; and, after their fettlement in the land of Canaan, made ufe of for the fame purpofe till the building of the temple of Jerufalem. It was divided into two parts, the one covered, and properly called the tabernacle; and the other open, called the court. The curtains which covered the tabernacle were made of linen, of feveral colours, embroidered. There were ten curtains, twenty-eight cubits long and four in breadth. Five curtains faftened together made up two coverings, which covered all the tabernacle. Over thefe there were two other coverings; the one of goat-hair, and the other of fheep fkins. The holy of holies was parted from the reft of the tabernacle by a curtain made faft to four pillars, ftanding ten cubits from the end. The length of the whole tabernacle was thirty-two cubits, that is, about fifty feet; and the breadth twelve cubits, or nineteen feet. The court was a fpot of ground one hundred cubits long, and fifty in breadth, inclofed by twenty columns, each twenty cubits high and ten in breadth, covered with filver, and ftanding on copper bafes, five cubits diftant from one another; between which, there were curtains drawn, and faftened with hooks. At the eaft end was an entrance, twenty cubits wide, covered with a curtain hanging loofe.

Feaft of TABERNACLES, a folemn feftival of the Hebrews, obferved after harveft, on the fifteenth day of the month Tifri, inftituted to commemorate the goodnefs of God, who protected the Ifraelites in the wildernefs, and made them dwell in booths, when they came out of Egypt. On the firft day of the feaft, they began to erect booths of the boughs of trees, and in thefe they were obliged to continue feven days. The booths were placed in the open air, and were not to be covered with cloths, nor made too clofe by the thicknefs of the boughs; but fo loofe that the fun and the ftars might be feen, and the rain defcend through them.

TABERNÆMONTANA, in botany, a genus of the pentandria monogynia clafs. It has two horizontal follicles; and the feeds are pulpous. There are three fpecies, all natives of America.

TABES, or CONSUMPTION. See MEDICINE, p. 103.

TABLATURE, in mufick, is, in general, when, to exprefs the founds or notes of a compofition, we ufe the letters of the alphabet, or any other characters not ufed in the modern mufick.

Laws of the twelve TABLES, were the firft fet of laws of the Romans, thus called, either by reafon the Romans then wrote with a ftyle on thin wooden tablets covered with wax; or rather, becaufe they were engraven on tables, or plates of copper, to be expofed in the moft noted part of the public forum. After the expulfion of the kings, as the Romans were then without any fixed or certain fyftem of law, at leaft had none ample enough to take in the various cafes that might fall between particular perfons, it was refolved to adopt the beft and wifeft laws of the Greeks. One Hermodorus was firft appointed to

to tranflate them, and the decemviri afterwards compiled and reduced them into ten tables. After a world of care and application, they were at length enacted and confirmed by the fenate and an affembly of the people, in the year of Rome 303. The following year they found fomething wanting therein, which they fupplied from the laws of the former kings of Rome, and from certain cuftoms which long ufe had authorifed: all thefe being engraven on two other tables, made the laws of the twelve tables, fo famous in the Roman jurifprudence, the fource and foundation of the civil or Roman law.

TABLES *of the law*, in Jewifh antiquity, two tables on which were written the decalogue, or ten commandments, given by God to Mofes on Mount Sinai. See DECALOGUE.

TABLE, in mathematics, a fyftem of numbers calculated to be ready at hand for the expediting aftronomical, geometrical, and other operations.

Aftronomical TABLES, are computations of the motions, places, and other phænomena of the planets.

TABORITES, a branch or fect of the ancient Huffites. They carried the point of reformation farther than Hufs had done, rejected purgatory, auricular confeffion, the unction of baptifm, tranfubftantiation, *&c.* They reduced the feven facraments of the Romanifts to four, *viz.* baptifm, the eucharift, marriage, and ordination.

TABRISTAN, a province of Perfia, fituated on the northern fhore of the Cafpian fea, having the province of Aftrabat on the eaft, and Gilan on the weft; being part of the ancient Hyrcania.

TACAMAHACA, in pharmacy, a folid refin, improperly called a gum, in the fhops: it is of a fragrant and peculiar fmell, and is of two kinds; the one called the fhell-tacamahaca, which is the fineft; the other, which is an inferior kind, being termed rough-tacamahaca, or tacamahaca in grains.

Some greatly commend tacamahaca in diforders of the breaft and lungs; but, at prefent it is very rarely ufed internally. Externally, however, it is in repute for foftening tumours, and mitigating pain and aches.

TACK, in a fhip, a great rope having a wale-knot at one end, which is feized or faftened into the clew of the fail; fo is reefed firft though the cheffe-trees, and then is brought through a hole in the fhip's fide. Its ufe is to carry forward the clew of the fail, and to make it ftand clofe by a wind: and whenever the fails are thus trimmed, the main-tack, the fore-tack, and mizen-tack, are brought clofe by the board, and haled as much forward on as they can be.

TACK, in Scots law. See LAW, Tit. xiii. 8, *&c.*

TACK-ABOUT, in the fea-language, is to turn the fhip about, or bring her head about, fo as to lie the contrary way.

TACKLE, among fea-men, denotes all the ropes or cordage of a fhip, ufed in managing the fails, *&c.*

TACTICS, in the art of war, is the method of difpofing forces to the beft advantage in order of battle, and of performing the feveral military motions and evolutions.

TADCASTER, a market-town of Yorkfhire, ten miles fouth weft of York

TADORNA, in ornithology. See ANAS.

TADPOLE, a young frog, before it has difengaged itfelf from the membranes that envelope it in its firft ftage of life. See RANA.

TÆNIA, in zoology, a genus of infects, belonging to the order of vermes zoophyta; the body of which is of an oblong form, and compofed of evident joints or articulations, in the manner of the links of a chain, with a mouth and vifcera in each joint; fo that the joints, which are exceedingly numerous, are in fome meafure fo many diftinct animals, and can live independent of each other. There are four fpecies; the folium, or tape-worm, is found in the bowels of men, and fifhes, and frequently extends to many yards in length. See MEDICINE, p. 160.

TÆNIA, in architecture, a member of the Doric capital, refembling a fquare fillet, or reglet: it ferves inftead of a cymatium.

TAFFETY, in commerce, a fine fmooth filken ftuff, remarkably gloffy.

TAGETES, in botany, a genus of the fyngenefia polygamia fuperflua clafs. The receptacle is naked; the pappus has five ftraight awns; the calix confifts of one tubulous leaf with five teeth; and there are five perfiftent flofcules in the radius. The fpecies are three, all natives of America.

TAGUS, the largeft river of Spain; which, taking its rife on the confines of Arragon, runs fouth-weft through the provinces of New Caftile and Eftremadura; and paffing by the cities of Aranjuez, Toledo, and Alcantara, and then croffing Portugal, forms the harbour of Lifbon, at which city it is about three miles over; and about eight or ten miles below this, it falls into the Atlantic ocean.

TAJACU, in zoology, a fpecies of hog. See SUS.

TAIL, the train of a beaft, bird, or fifh; which, in land animals, ferves to drive away flees, *&c.* and in birds and fifhes, to direct their courfe, and affift them in afcending or defcending in the air or water.

TAILZIE, in Scots law. See LAW, Tit. xxvii. 8, *&c.*

TAINE, a port-town of Rofs-fhire, in Scotland, fituated on the fouth-fide of the frith of Sutherland, feven miles north of Cromarty: W. long. 3° 38′, N. lat. 58°.

TALC, in natural hiftory, a large clafs of foffil bodies, compofed of broad, flat, and fmooth laminæ or plates, laid evenly and regularly on one another; eafily fiffile, according to the fite of thefe plates, but not all fo in any other direction; flexile, and elaftic; bright, fhining, and tranfparent; not giving fire with fteel, nor fermenting with acid menftrua, and fuftaining the force of a violent fire without calcining.

TALENT, money of account among the ancients.

Among the Jews, a talent in weight was equal to 60 maneh, or 113 lb. 10 oz. 1 dwt. $10\frac{2}{7}$ gr.

TALIO, *lex talionis*, a fpecies of punifhment in the Mofaic law, whereby an evil is returned fimilar to that committed againft us by another; hence that expreffion, eye for eye, tooth for tooth.

TALISMANS, magical figures cut or engraved with fuperftitious obfervations on the characterifms and configurations of the heavens, to which fome aftrologers have attributed wonderful virtues, particularly that of calling down celeftial influences. The talifmans of Samothrace, fo famous of old, were pieces of iron formed into certain images, and fet in rings; thefe were efteemed preferva-

tives against all kinds of evils. There were likewise talismans taken from vegetables, and others from minerals.

TALLOW, in commerce, the fat of certain animals, melted down and clarified, so as to be fit for making candles, *&c.*

TALLOW-TREE, a remarkable tree growing in great plenty in China; so called, from its producing a substance like tallow, which serves for the same purpose: it is about the height of a cherry-tree, its leaves in form of a heart, of a deep shining red colour, and its bark very smooth. Its fruit is inclosed in a kind of pod, or cover, like a chesnut, and consists of three round white grains, of the size and form of a small nut, each having its peculiar capsula, and within a little stone. This stone is encompassed by a white pulp which has all the properties of true tallow, both as to consistence, colour, and even smell; and accordingly the chinese make their candles of it; which would doubtless be as good as those in Europe, if they knew how to purify their vegetable, as well as we do our animal, tallow.

TALLY, a piece of wood cut in two parts, whereon accounts were anciently kept, by means of notches; one part of the tally being kept by the debtor, and the other by the creditor.

TALMUD, among the Jews, a collection of the doctrines of their religion and morality. It is the *corpus juris*, or body of the laws and customs of the Jews, who esteem it equal to the scriptures themselves.

TALPA, in zoology, a genus of quadrupeds belonging to the order of feræ. There are six fore-teeth in the upper-jaw, and eight in the under-jaw; they have one large dog-tooth, and four smaller ones. There are two species, *viz.* the caudata, or common mole, with a tail, and five toes on the feet; it is a native of Europe, feeds upon worms, and, by raising the earth, infests gardens and cultivated grounds. This animal has a penis much longer, in proportion to the size of its body, than any other creature. The fur is exceedingly smooth and fine. Though generally believed to be blind, it has a couple of small eyes mostly hid with hair. 2. The asciatica has no tail, and but three toes on its feet. It is a native of Siberia.

TAMANDAU, in zoology. See MYRMECOPHAGA.

TAMARINDUS, in botany, a genus of the triandria monogynia class. The calix consists of four segments, and the corolla of three petals; the nectarium consists of two short bristles under the filaments; and the pod is pulpy. There is but one species, a native of Ægypt, Arabia, *&c.*

The pod is made up of a double rind, or membrane, between which is a pulpy matter; which taken in the quantity of two or three drams, or an ounce or more, proves gently laxative or purgative; and at the same time, by its acidity, quenches thirst, and allays immoderate heat.

TAMARIX, in botany, a genus of the pentandria trigynia class. The calix consists of five segments, and the corolla of five petals: the capsule has one cell, and three valves; and the seeds are pappous. There are two species, none of them natives of Britain.

The bark and leaves of the tamarix-tree are moderately astringent.

TAMBAC, a mixture of gold and copper, which the people of Siam hold more beautiful, and set a greater value on, than gold itself.

TAMUS, in botany, a genus of the diœcia hexandria class. The calix of both male and female consists of six segments; neither of them have any corolla; the stylus is trifid; and the berry has three cells, containing two seeds. There are two species, none of them natives of Britain.

TAMWORTH, a borough of Staffordshire, situated twenty miles south-east of Stafford. It sends two members to parliament.

TAN, the bark of the oak, chopped and ground in a tanning-mill into a coarse powder, to be used in the tanning of leather. See TANNING.

TANACETUM, in botany, a genus of the syngenesia polygamia æqualis class. The receptacle is naked; and the calix is hemispherical and imbricated. There are eight species, only one of them, *viz.* the vulgare, or common tansy, a native of Britain.

Tanzy, considered as a medicine, is a moderately warm bitter, and is much extolled by some in hysteric complaints, especially if proceeding from a deficiency or suppression of the uterine purgations: its seeds and leaves have been in considerable esteem as anthelmintics; and are said to be good in colics and flatulencies.

TANGENT of an arch is a right-line drawn perpendicularly from the end of a diameter, passing to one extremity of the arch, and terminated by a right-line drawn from the centre through the other end of the arch, and called the secant. See GEOMETRY.

TANGIER, a port-town of Africa, in the empire of Morocco and kingdom of Fez, situated at the entrance of the straits of Gibraltar, in W. long. 7°, N. lat. 35° 40′. It was the capital of the ancient Mauritania Tingitana, and was once in the possession of the English.

TANGUT, a province of Chinesian Tartary, situated north-west of the great wall which divides Tartary from China.

TANJOUR, a city of the hither India, capital of a province of the same name, situated E. long. 79°, N. lat. 11° 30′.

TANNER, one who dresses hides, *&c.* by tanning them. See the next article.

T A N N I N G.

TANNING is the art of preparing raw hides or skins for the hand of the currier; or for immediate use, without any further operation.

The first part of this definition includes all leather used for the upper part of shoes, coaches, coach-harness, sadler-leather, *&c.* and the last, the manufacture of bin or backs, *&c.*

We shall first give a general account of the process of manu-

manufacturing leather comprehended under the first part of the definition; and then explain separately the particular operations comprehended under the general process.

When the hide or skin is received raw from the hand of the butcher, it is thrown into a water-dub or other piece of water, to cleanse it from the blood and gore; after which, the horns and tail are cut off: then it is put into the lime, and wrought there according to the directions given below; from thence it is wrought into the bait, and cleansed there from the lime, &c. It is next transferred to the ooze; and when properly filled, according to the directions on that head, it is conveyed to the tann-pit, where it is tanned; which finishes the process.

Before we proceed, it will be necessary to give a short view of the nature and structure of leather, which will contribute to explain the reason of the different operations it passes through.

All hides or skins, when received from the hand of the butcher, are a bundle of connected tubes, somewhat resembling a honey-comb fixed on a basis; on the flesh-side, of an extreme close texture; but all open on the hair or grain side. These tubes contain a fatty or mucilaginous kind of matter; which, if allowed to remain in a fluid state, would corrupt the leather, and, if dried in the hide, would not only occasion a crisp or hardness in the leather, and be easily softened by moisture; but would also, in the course of tanning, in a great measure oppose every substance that can be applied to consolidate and preserve the hide from corruption.

To extract this matter; to swell and expand the pores as much as they can bear, without a disunion of parts, in order to increase the thickness, and the more easily to re-fill or introduce a matter less subject to changes from drought and moisture; to preserve the fibres that compose the leather from putrefaction; and to consolidate the whole into one durable mass; are the ends proposed by the several operations of tanning.

Of Liming.

The extraction of the matter contained in the pores being the first aim of the tanner, the first step is to open and expand the fibres, that the matter may be the more easily ejected, in order to give room for the subsequent reception of the tan. This is done by common slacked lime infused in water, and is made up in a pit built with stone, of a length sufficient to contain a midling hide, but seldom so broad as to allow it to lie at its full breadth. The hides are generally treated in the lime in the following manner. They are thrown into a lime-dub, of a weak or slack consistence at first; where they are drawn out and thrown in twice or thrice every day, for a few days. They are then conveyed to a lime of a stronger quality, and drawn as before, though perhaps not so often; once in a day, or once in two days when they are further advanced, may suffice. After they have lain there for ten or fourteen days, the strength of the lime may be increased, or they may be carried to one of a stronger nature, where they are drawn and returned as before till they be completely limed.

As the hastening and retarding the operation in particular cases may be necessary; and as it is material for the quality of the leather, that the lime should make an equal impression upon the hide; or rather, if possible, that the weaker parts should be saved, and the stronger more exposed; the following observation may be of use. In most yards there are from 20 to 40 hides or upwards wrought in a lime at a time. When these hides are all thrown in, they must necessarily be made to lie spread out upon one another, as close as possible, to take up little room. By this means those that are near the bottom of the pit will be squeezed so closely together by the pressure of the superior hides, that the water, the medium by which the lime is communicated to them, will be almost entirely excluded from acting upon the body of the hide, while the bellies and other outer skirts will be exposed to its full force. For this reason, it is necessary to change their position often, that the different parts of the hides may have nearly the same opportunity of being impregnated with the lime: and in this view, since drawing in the limes is necessary, it is also evident, that no prejudice can accrue to the leather from the frequent repetition of it, but may be greatly hurt if it is neglected. The often drawing of leather must not only bring on the operation more equally, but must at the same time quicken the effect of the lime, as the exposure of the hide to the air and lime by turns will give it an opportunity of acting with greater force. Besides, the workman has it in his power, every time the dub is drawn, either to add new strength to it (if necessary) by giving more lime, or to make it exert the strength it already possesses by stirring or raising the lime from the bottom. Thus the workman has it greatly in his power to accelerate or retard the operation as he shall think proper. Small leather ought to be drawn oftener than large, as it is not so able to resist the strength of the lime. During very hot weather the lime will operate more quickly than in cold: therefore the workman ought to pay a strict attention to the state of his limes at that time, and draw oftener. The rays of the sun, if allowed to act any time on the leather when it is in the draught, will greatly hurt it.

From the above hints, the workman will be enabled to form some judgment how to vary his work according to the different circumstances that may occur. And here it would seem requisite, that some directions should be given for knowing when the leather is sufficiently limed. But it is impossible to convey ideas in an intelligible manner by words, which can only be acquired by practice and frequent observation. Only we may observe in general, as the hide becomes limed, it leaves the original raw fleshy appearance, has more of the appearance of being boiled, and becomes more plump and spungy. But all these appearances are the more visible in proportion as the leather is over-done; and therefore it would be extremely dangerous for a person without experience to trust to the above marks. However, though the time taken to perform this operation may be much varied; yet the ordinary time for a middling hide is from 4 to 6 weeks, and so in proportion for larger and smaller leather.

Of Baiting, *and other work before* Oozing.

The hide is now stript of its hair, and all the slimy fatty stuff separated from the leather that is found adhering to the flesh-side; the first of which operations is called hairing, and the last fleshing. After which, as it is the workman's aim to discharge the matter contained in the pores of the leather, as also the particles of lime that may have insinuated themselves during the liming; and as the lime will be found to have communicated a degree of elasticity to the fibres, and a tenacious quality to the matter; it is necessary to unbrace and relax the fibres, and bring the matter to

to be ejected into a greater ſtate of fluidity before we attempt to repel it. An infuſion of hen or pigeon dung and water, (which is called a bait,) has been found to be the moſt effectual thing for anſwering the above end. Into this infuſion the hides are thrown promiſcuouſly, where they are drawn in the ſame manner as directed in the article of liming; and in proportion to the draughts given, the ſtrength of the leather, trim of the bait, *&c.* the workman will find his point gained from 4 to 8 days: he will find the leather reduced to a ſoft mellow conſiſtence without any corruption or decay of parts, the matter more fluid and leſs tenacious, and eaſily ſeparable from the hide upon working it on the beam with the tanners knife: but as once working cannot purify the hide, the workman muſt ſoak it in water, and work it on the beam, alternately, ſuch a number of times as his judgment ſhall direct, in order to purge it thoroughly; and as it was obſerved before, that all the pores of the leather were open on the grain-ſide, moſt of the work ſhould be applied on that ſide. As a putrefaction or corruption of the parts, or an extention of the fibres beyond their proper tone, can never be remedied when once begun, the over-doing or undue management either in baiting or liming, muſt be equally fatal. To obtain the ends propoſed by theſe two operations, and at the ſame time to guard againſt their bad effects, require more experience and knowledge in the nature of leather than any other operation it has afterwards to go through.

Of Oozing.

The hide, when ready for the ooze, ought to be nothing but a bundle of empty tubes void of all fluid matter; that is, compoſed of nothing but what is called the ſolids of the hide, without any decay or corruption.

It is now the tanner's buſineſs to fill theſe tubes or pores with a more durable matter, in order to ſupport the fabrick of the leather; which is the end of oozing. A number of different ſubſtances have been tried for this purpoſe; but none are equal to oak-bark. This bark, after it is thoroughly dried, is pounded, or rather bruiſed with a mill or other inſtrument; the powder is ſifted out for the purpoſe of making up oozes, which is only an infuſion of this powder in common water; an old or exhauſted ooze (if not begun to corrupt) may be renewed by adding more bark, according to the ſtrength of the ooze required. This liquor is depoſited in a number of handlers or duſters, (as they are called,) as occaſion requires, and the hides are thrown promiſcuouſly into it, where they muſt be drawn and returned much in the ſame manner as directed in the article of liming, and carried from a weaker to a ſtronger ooze as the leather ſhall require, till they are found to be ſufficiently filled. It will be found, that the finer particles of the bark will inſinuate themſelves into the pores of the leather, and lodge there; and at ſame time the aſtringent quality will ſtrengthen and brace the fibres, and bring them again to their proper tone, after their relaxed ſtate in the bait, which will make the leather appear to ſwell, and feel plump and ſoft. Here again no rule can direct an unexperienced perſon to know when a hide is properly oozed; and indeed ſome kinds of leather require a greater and ſome a leſſer degree of it, according to the purpoſe for which it is intended; but in general, there is leſs danger in oozing plentifully than in being ſparing of it, as it always adds to the weight and beauty of the leather. A middling hide may be oozed in three weeks, and ſooner or later in proportion to the ſtrength of the ooze, the number of draughts, and heat of the weather.

Of Lopping, *or what is more properly called* Tanning.

This part of the operation is deſigned to preſerve the fibres from corruption, and at the ſame time to conſolidate the whole into one compact body; or, in ſome ſenſe, it may be called *lignifying* the hide, (if the term may be allowed.) This muſt evidently be the work of time, as the nature of the fibres muſt be in a great meaſure changed, and the new-imbibed matter incorporated and conſolidated with them. In order to perform this, the hides are ſpread out at their full breadth and length in a vat, and a ſtratum of beat bark thrown betwixt each of them. This vat holds at firſt as much liquor as will juſt cover the hides; and in this ſituation they are allowed to lie till the ſtrength of the bark is thought to be exhauſted, which is commonly from four to ſix weeks; and the operation is repeated till the hides are ſufficiently tanned, and which is generally from two to four times, according to the ſtrength of the leather. The bark ſhould be rounder beat, and more given to the lop, for large hides than ſmall ones; and conſequently larger leather ſhould lie longer in the lop.

Of Currying.

The leather, when only tanned, is not ſufficiently ſoft and pliable to anſwer a number of purpoſes. The currier's province is to reduce the leather to the proper thickneſs, pliableneſs, and colour, requiſite for the different uſes to which it is applied: and though there is a material difference in the method of manufacturing the ſeveral kinds, and a good deal of dexterity required; yet what could be here ſaid of them would be of little uſe to thoſe who are unacquainted with the buſineſs. We ſhall therefore reduce all we are to ſay on this ſubject to a general detail of the proceſs.

The leather, after it has driped ſome time from the tan-pit, is ſhaven on an upright beam with a knife whoſe edge is turned on the one ſide, and with which the currier can take down the leather in the ſame manner as a wright can take a ſhaving from a piece of wood with his plane. After the currier has thus levelled the hide or ſkin to his purpoſe, (which is always done on the fleſh-ſide,) he ſpreads it out on a ſtone or table made for the purpoſe, and there ſcours it on the grain-ſide from all the looſe tan, and other ſtuff that may hurt the beauty of the grain. He then puts on a certain quantity of oil on both grain and fleſh ſide, for the purpoſe of ſoftening the fibres, and at the ſame time making them tough, and hangs it up to dry. When it is ſufficiently dry, there is a thin ſhaving again taken off the fleſh-ſide, in order to clean or brighten it up; and then it is rubbed backward and forward upon a table by the currier with a nicked or furrowed board, keeping the leather always doubled at the place where he rubs, till it be made ſoft and pliable to his intention. This laſt part of the operation is properly called *Currying*, and it is from this that the buſineſs gets its name. As to the colour, the leather is fair or dark in proportion to the quantity of oil laid on, if the tanning has been properly performed, and the currier do not neglect ſome material part of his duty. Curriers ſeldom dye any colour but black, which is done with copperas and a very little logwood.

TANTALUS's

TANTALUS's cup. See HYDROSTATICS, p. 808.

TANZY, in botany. See TANACETUM.

TAPE-WORM. See TÆNIA.

TAPESTRY, a curious kind of manufacture, serving to adorn a chamber or other apartment, by covering or lining the walls thereof. It is a kind of woven hangings of wool and silk, frequently raised and enriched with gold and silver, representing figures of men, animals, landskips, histories, &c.

TAPPING, in general, the act of piercing an hole in a vessel, and applying a tube or canula in the aperture, for the commodious drawing off the liquors contained therein.

TAPPING, in surgery. See SURGERY, p. 655.

TAR, a thick, black, unctuous substance, obtained from old pines and fir-trees, by burning them with a close smothering heat: much used in coating and caulking ships, &c. See the article PITCH.

Water impregnated with the more soluble parts of tar, proves, in consequence of this hot pungent oil, warm and stimulating: it sensibly raises the pulse, and quickens the circulation. By these qualities, in cold, languid, phlegmatic habits, it strengthens the solids, attenuates viscid juices, opens obstructions of the minuter vessels, and promotes perspiration and the fluid secretions in general; whilst in hot bilious temperaments, it disposes to inflammation, and aggravates the complaints which it has been employed to remove.

TARACON, a city of Spain, in the province of Arragon, situated on the confines of Old Castile: W. long. 2° 6′, and N. lat. 41° 55′.

TARAGON, a city and port-town of Spain, in the province of Catalonia, situated on the Mediterranean sea: in E. long. 1° 15′, and N. lat. 41° 6′.

TARANTO, a port-town of Italy, in the kingdom of Naples, situated on the gulph of Otranto, forty-five miles west of that city, being the see of an archbishop.

TARANTULA, in zoology. See ARANEA.

TARE, is an allowance for the outside package, that contains such goods as cannot be unpacked without detriment; or for the papers, threads, bands, &c. that inclose or bind any goods imported loose; or, though imported in casks, chests, &c. yet cannot be unpacked and weighed nett.

TARENTAIS DUCHY, the south division of Savoy, having Piedmont on the south-east, and Savoy Proper on the north-west: subject to the king of Sardinia.

TARGET, a kind of shield or weapon of defence made use of by the ancients.

TARGUM, a name whereby the Jews call the Chaldee paraphrases, or expositions of the Old Testament in the Chaldee language. See BIBLE.

TARIF, a table or catalogue, containing the names of different sorts of merchandize, with the duties to be paid, as settled by authority, amongst trading nations.

TARPEIAN, in Roman antiquity, an appellation given to a steep rock in Rome: whence, by the law of the twelve tables, those guilty of certain crimes were precipitated.

TARSUS in anatomy. See ANATOMY, p. 185.

TARSUS, now Terasso, once the capital of Cilicia, in the Lesser Asia, now a province of Asiatic Turky, is situated on the north side of the Levant sea: E. long. 35°, N. lat. 37°.

TARTAR. See CHEMISTRY, p. 98, 165.

TARTARY, a vast country in the northern parts of Asia, bounded by Siberia on the north and west: this is called Great-Tartary. The Tartars who lie south of Moscovy and Siberia, are those of Astracan, Circassia, and Dagistan, situated north-west of the Caspian-sea; the Calmuc Tartars, who lie between Siberia and the Caspian-sea; the Usbec Tartars and Moguls who lie north of Persia and India; and, lastly, those of Tibet, who lie north-west of China.

TASSEL, a sort of pendant ornament at the corners of a cushion, or the like.

In building, tassels denote those pieces of board that lie under the ends of the mantlet-rees.

TASTE, in physiology, a peculiar sensation excited by means of the organs of taste, *viz.* the papillæ on the tongue. See ANATOMY, p. 304.

Intellectual TASTE. The external sense, with which nature has furnished us, and by which we distinguish and relish the various kinds of nourishment that are adapted to health and pleasure, has in all languages given occasion to the metaphorical word *taste*, by which we express our perception of beauty, deformity, or defect, in the several arts. *Taste* then, in general, is a quick discernment, a sudden perception, which, like the sensation of the palate, anticipates reflection; like the palate, it relishes what is good with an exquisite and voluptuous sensibility, and rejects the contrary with loathing and disgust; like the palate also, it is often doubtful, and, as it were, bewildered, not knowing whether it should relish or reject certain objects, and frequently requires the influence of habit to give it a fixed and uniform determination.

To have a taste, supposes something more than merely to perceive and to discern with accuracy the beauty of any work or object. This beauty must be *felt*, as well as *perceived*; the mind must be touched and affected by it in a lively and sensible manner. This feeling however, in order to constitute true *taste* must not be a vague and confused sensation; but must be attended with a distinct view, a quick and comprehensive discernment of the various qualities, in their several relations and connections, which enter into the composition of the object we contemplate. And in this we see another striking resemblance between the intellectual taste and the sensual one: for as a nice palate perceives immediately the mixture of different wines, so the man of taste will quickly discern the motley mixture of different styles in the same production; and, let the beauties and defects be ever so closely blended in an object, will always be capable of distinguishing the former from the latter.

As the corruption of the *sensual taste* discovers itself by a relish for only those delicate and high-seasoned dishes, in which all the refinements of art have been employed to excite a forced sensation of pleasure; so the depravity of the *intellectual taste* manifests itself by an attachment to far-fetched and studied ornaments, and by a want of relish for those beauties which are unaffected and natural. The corruption of the sensual taste, which makes us delight in such aliments as are disgusting to those whose organs are in a good state, is in reality a kind of disease; nor is that depravity of the intellectual taste which makes many prefer the *burlesque* to the *sublime*, and the laboured stiffness of art to the beautiful simplicity of nature, less a disease in our mental frame.

The intellectual *taste* is much more formed by education and culture, than the sensual one; for though the latter

latter may be brought, by habit, to reliſh what at firſt excited loathing and diſguſt; yet it does not ſeem to have been the intention of nature, that the generality of mankind ſhould acquire by cuſtom and experience thoſe ſenſations and perceptions which are neceſſary to their preſervation. It is otherwiſe with the *intellectual taſte*: its formation requires time, inſtruction, and experience. A young man uninſtructed in the arts of muſick and painting, let his natural ſenſibility be ever ſo quick and lively, will not immediately diſtinguiſh, in a grand concert of muſick, the various parts whoſe connection and relation conſtitute the eſſence and charm of the compoſition; nor will he perceive in a picture the gradations of light and ſhade, that harmony of colours, that correctneſs of deſign, which characteriſe a finiſhed piece; but in proceſs of time, and alſo by degrees, he learns both to hear and to ſee in a more perfect manner. The ſame uninſtructed perſon will find a variety of emotions ariſe in his mind the firſt time he is preſent at the repreſentation of a fine tragedy: but he will neither perceive the dexterity of the author in maintaining the unities; nor that exquiſite art by which the drama is ſo managed, that no perſon enters upon the ſcene nor quits it without an evident reaſon; nor yet that ſtill more nice and difficult art of making the various ſubordinate intereſts terminate and centre in one, which abſorbs them all. It is only by the force of habit and reflection, that he will diſtinguiſh theſe ſeveral objects of *taſte*, and feel delightful ſenſations from circumſtances of which formerly he had little or no idea.

Elegant and able artiſts may communicate their feelings and their diſcernment to others, and thus excite *taſte* in a nation, which, without them, had never known its refined pleaſures. By frequently contemplating the works of great and eminent maſters in the various arts, the powers of nature ariſe into taſte; and we imbibe, as it were, the ſpirit of theſe illuſtrious men, ſo as to come at length to look at a gallery of paintings with the eyes of a Le Brun, a Pouſſin, or a Le Sueur; nay, we even read works of learning and genius with a portion of that ſpirit that appears in their compoſition.

If, in the firſt periods of the culture of the arts and ſciences, it has ſometimes happened, that a whole nation have been unanimous in the praiſe of authors full of defects, and whom ſucceeding ages have beheld with indifference, and even with contempt; the reaſon is, that theſe authors had natural beauties which were perceived by all, while that juſt diſcernment that was neceſſary to diſtinguiſh their numerous defects, and which is leſs the gift of nature, than the reſult of time, habit, and reflection, was as yet acquired by none. Thus Lucilius, who had been in the higheſt reputation among the Romans, ſunk into oblivion when Horace aroſe; and Regnier was univerſally admired by the French, until Boileau appeared; and if there are ſeveral ancient authors, who have maintained their credit, notwithſtanding the abſurdities that are to be found in every page of their writings, it muſt be the authors of thoſe nations, among whom no judicious and correct writer has appeared to open their eyes, like Horace among the Romans, and Boileau among the French.

It is a common ſaying, that there is no diſputing about taſtes: and if by the *taſte* here be underſtood the palate, which loaths certain aliments and reliſhes others, the maxim is juſt; becauſe it is needleſs to diſpute about what cannot be corrected, or to attempt reforming the conſtitution and mechaniſm of organs merely corporeal. But the maxim is falſe and pernicious, when applied to that *intellectual taſte* which has for its objects the arts and ſciences. As theſe objects have real charms, ſo there is in reality a good taſte which perceives them, and a bad one which perceives them not; and there are certain methods by which we may often correct thoſe mental defects which produce a depraved *taſte*. But it muſt be granted, at the ſame time, that there are certain phlegmatick ſpirits, which nothing can enflame; and alſo certain diſtorted intellects, which it is impoſſible to rectify: with ſuch therefore, it is in vain to diſpute about taſtes, becauſe they have none at all.

In many things taſte ſeems to be of an arbitrary nature, and without any fixed or uniform direction, ſuch as in the choice of dreſs and equipage, and in every thing that does not come within the circle of the finer arts. In this low ſphere it ſhould be diſtinguiſhed by the name of *fancy*; for it is *fancy*, rather than *taſte*, that produces ſuch an endleſs variety of new and contradictory modes.

The taſte of a nation may degenerate and become extremely depraved; and it almoſt always happens, that the period of its perfection is the forerunner of its decline. Artiſts, through the apprehenſion of being regarded as mere imitators, ſtrike out into new and uncommon paths, and turn aſide from the beautiful ſimplicity of nature, which their predeceſſors invariably kept in view. In theſe efforts there is a certain degree of merit, which ariſes from induſtry and emulation, and caſts a veil over the defects which accompany their productions. The public, fond of novelty, applauds their invention; but this applauſe is ſoon ſucceeded by ſatiety and diſguſt. A new ſet of artiſts ſtart up, invent new methods to pleaſe a capricious taſte, and depart ſtill further from nature than thoſe who firſt ventured from its paths into the wilds of fancy. Thus the taſte of a people degenerates into the groſſeſt corruption. Overwhelmed with new inventions, which ſucceed and efface each other with incredible rapidity, they ſcarcely know where they are, and caſt back their eager and anxious deſires towards the period when *true taſte* reigned under the empire of nature. But they implore its return in vein; that happy period cannot be recalled; it depoſits, however, in the cuſtody of certain choice ſpirits, the ſublime pleaſures of *true taſte*, which they cheriſh and enjoy in their little circle, remote from the profane eye of the depraved and capricious multitude.

There are vaſt countries, where *taſte* has not yet been able to penetrate. Such are thoſe uncultivated waſtes, where civil ſociety has never been brought to any degree of perfection, where there is little intercourſe between the ſexes, and where all repreſentations of living creatures in painting and ſculpture are ſeverely prohibited by the laws of religion. Nothing renders the mind ſo narrow, and ſo little, if we may uſe that expreſſion, as the want of ſocial intercourſe; this confines its faculties, blunts the edge of genius, damps every noble paſſion, and leaves in a ſtate of langour and inactivity every principle that could contribute to the formation of *true taſte*. Beſides, where ſeveral of the finer arts are wanting, the reſt muſt neceſſarily languiſh and decay, ſince they are inſeparably connected together, and mutually ſupport each other. This is one reaſon, why the Aſiatics have never excelled in any of the arts; and hence alſo it is that *true taſte* has been confined to certain countries in Europe.

TATA,

TATA, or SINDA, the capital of a province of the same name in the Hither India, in Asia, situated at the mouth of the Indus: E. long. 68°, N. 25° 40′.

TAT-TOO, a beat of a drum at night, to advertise the soldiers to retreat or repair to their quarters in their garrison, or to their tents in a camp.

TAU, or TAW, in heraldry, an ordinary in figure of a T, supposed to represent St. Andrew's cross, or a cross potence, the top part cut off. See CROSS.

TAVASTUS, the capital of the province of Tavastia, in the territory of Finland in Sweden, situated eighty-four miles north-east of Abo: E. long. 24°, N. lat. 61° 20′.

TAUGHT, or TAU'T, in the sea-language, signifies the same as stiff, or fast: thus, to set taught the shrouds or stays, is to make them more tight and stiff.

TAVISTOCK, a borough of Devonshire, thirty-two miles west of Exeter.

It sends two members to parliament, and gives the title of marquis to the noble family of Russels dukes of Bedford.

TAUNTON, a borough of Somersetshire, twenty miles miles south-west of Wells. It sends two members to parliament.

TAURIS, or TABRIS, a city of Persia, four hundred miles north of Ispahan: E. long. 46° 30′, N. lat. 38° 20′.

TAURUS, the BULL, in zoology, See BOS.

TAURUS, in astronomy. See ASTRONOMY, p. 847.

TAUTOLOGY, a needless repetition of the same thing in different words.

TAWING, the art of dressing skins in white, so as to be fit for divers manufactures, particularly gloves, *&c.*

All skins may be tawed: but those chiefly used for this purpose are lamb, sheep, kid, and goat skins.

The method of tawing is this: Having cleared the skins of wool or hair, by means of lime, they are laid in a large vat of wood or stone, set on the ground full of water, in which quick-lime has been slaked; wherein they are allowed to lie a month or six weeks, according as the weather is more or less hot, or as the skins are required to be more or less soft and pliant.

While they are in the vat, the water and lime is changed twice, and the skins are taken out and put in again every day; and when they are taken out for the last time, they are laid all night to soak in a running water, to get out the greatest part of the lime; and in the morning are laid together by sixes one upon another, upon the wooden leg (and are scraped stoutly one after another, to get the flesh off from the fleshy side, with a cutting two-handled instrument called a knife; and then they cut off the legs, (if they are not cut off before) and other superfluous parts about the extremes. Then they are laid in a vat or pit with a little water, where they are fulled with wooden pestles, for the space of a quarter of an hour; and then the vat is filled up with water, and they are rinsed in it.

In the next place, they are thrown on a clean pavement to drain, and afterwards cast into a fresh pit of water, out of which they rinse them well, and are laid again on the wooden leg, six at a time, with the hair-side outermost; over which they rub a kind of whetstone very briskly, to soften and fit them to receive four or five more preparations, given them on the leg, both on the flesh-side and the hair-side, with the knife, after the manner above-mentioned.

After this they are put into a pit of water and wheaten-bran, and stirred about in it with wooden poles, till the bran is perceived to stick to them, and then they are left: as they rise of themselves to the top of the water by a kind of fermentation, they are plunged down again to the bottom; and at the same time fire is set to the liquor, which takes as easily as if it were brandy, but goes out the moment the skins are all covered.

They repeat this operation as often as the skins rise above the water; and when they have done rising they take them out, lay them on the wooden leg, the fleshy side outwards, and pass the knife over them to scrape off the bran.

Having thus cleared them of the bran, they lay the skins in a large basket, and load them with huge stones to promote their draining: and when they have drained sufficiently, they give them their feeding, which is performed after the manner following:

For one hundred of large sheep-skins, and for smaller in proportion, they take eight pounds of alum, and three of sea-salt, and melt the whole with water in a vessel over the fire, pouring the dissolution out, while yet lukewarm, into a kind of trough, in which is twenty pounds of the finest wheat flower, with the yolks of eight dozen of eggs; of all which is formed a kind of paste, a little thicker than children's pap; which, when done, is put into another vessel, to be used in the following manner.

They pour a quantity of hot water into the trough in which the paste was prepared, mixing two spoonfuls of the paste with it; to do which they use a wooden spoon, which contains just as much as is required for a dozen of skins: and when the whole is well diluted, two dozen of the skins are plunged into it; but they take care that the water be not too hot, which would spoil the paste and burn the skins.

After they have lain some time in the trough, they take them out, one after another, with the hand, and stretch them out; this they do twice; and after they have given them all their paste, they put them into tubs, and there full them afresh with wooden pestles.

Then they put them into a vat, where they are suffered to lie for five or six days, or more; then they take them out in fair weather, and hang them out to dry on cords or racks: and the quicker they are dried the better; for if they be too long a drying, the salt and alum within them are apt to make them rise in a grain, which is an essential fault in this kind of dressing.

When the skins are dry, they are made up into bundles, and just dipt in fair water, and taken out and drained; and being thrown into an empty tub, and after having lain some time are taken out and trampled under foot.

Then they draw them over a flat iron-instrument, the top of which is round like a battledore, and the bottom fixed into a wooden block, to stretch and open them; and having been opened, they are hung in the air upon cords to dry; and being dry, they are opened a second time, by passing them again over the same instrument.

In the last place they are laid on a table, pulled out, and laid smooth, and are then fit for sale.

TAX, a tribute rated upon every town, which formerly

was wont to be paid annually into the King's-exchequer, but now not without confent of parliament; it differs from a fubfidy in this, that it is always certain, as fet down in the exchequer-book, and in general levied of every town, and not particularly of every man, *&c.* The ancient way of levying taxes was by tenths and fifteenths, afterwards by fubfidies and royal aids, and at length by a pound rate; the former of thefe were all upon the perfon and perfonal eftate, but the laft upon lands and rents.

TAXUS, in botany, a genus of the diœcia monodelphia clafs. The calix of both male and female confifts of three leaves; neither of them have any corolla; the ftamina are numerous; the antheræ are rotated, and divided into eight fegments; the female has no ftylus; and the berry contains one feed. There are two fpecies, only one of them, *viz.* the baccata, or yew-tree, a native of Britain.

TAY, a river of Scotland, rifing from the loch or lake of Tay, in Braidalbin, and running eaft through Athol: it afterwards turns fouth-eaft, and dividing the counties of Perth and Angus from Strathern and Fife, falls into the frith of Tay.

TAYVEN, a city of China, in Afia, in the province of Xanfi, two hundred and forty miles fouth-weft of Pekin: E. long. 108°, N. lat. 38° 30′.

TEA, or THEA, in botany, a genus of the polyandria monogynia clafs of plants. The corolla confifts of nine petals, and the calix of five leaves; and the berry is tricoccous. There are two fpecies, both natives of China.

This fhrub grows to five or fix feet high, and is very ramofe: the leaves are about an inch long, near half an inch broad, ferrated, and terminating in a point. The traders in tea diftinguifh a vaft many kinds of it, as they differ in colour, flavour, and the fize of the leaf. To enumerate the feveral fubdiftinctions were endlefs; the general divifion is into three kinds, the ordinary green-tea, the finer green, and the bohea; to one or other of which all the other kinds may be referred. The common green tea has fomewhat fmall and crumpled leaves, much convoluted, and clofely folded together in the drying. Its colour is a dufky green, its tafte fub-aftringent, and its fmell agreeable. It gives the water a ftrong yellowifh green colour. The fine green has larger leaves, lefs rumpled and convoluted in the drying, and more lax in their folds; it is of a paler colour, approaching to the blue-green, of an extremely pleafant fmell, and has a more aftringent, yet more agreeable tafte than the former. It gives a pale-green colour to water. To this kind are to be referred all the higher priced green teas, the hyfon, imperial, *&c.* The bohea confifts of much fmaller leaves than either of the other, and thofe more crumpled and clofely folded than in either. It is of a darker colour than the other, often blackifh; and is of the fmell and tafte of the others, but with a mixed fweetnefs and aftringency. The green teas have all fomewhat of the violet-flavour; the bohea has naturally fomewhat of the rofe-fmell. The leaves when gathered are dried with great caution, partly by the help of heat, partly by the air, and when thoroughly prepared will keep a long time frefh and good. Every parcel, when dried, though gathered promifcuoufly, is feparated, according to the largenefs and fmallnefs of the leaves, into three or four different kinds, each of which is of a different price, and has its different name. The bohea tea is gathered before the leaves are perfectly opened, and is made to undergo a greater degree of heat in the curing, to which its colour and peculiar flavour is in a great meafure owing.

Tea, moderately and properly taken, acts as a gentle aftringent and corroborative.

TEAL, in ornithology. See ANAS.

TEARS, a lymph or aqueous humour, which is fubtile, limpid, and a little faltifh: it is feparated from the arterial blood by the lachrymal glands, and fmall glandulous grains on the infide of the eye-lids. See ANATOMY, p. 294.

TEBETH, the tenth month of the Jewifh ecclefiaftical year, and fourth of the civil. It anfwers to our month of December.

TECKLENBURG, a city of Germany, in the circle of Weftphalia, capital of a county of the fame name, thirteen miles fouth-weft of Ofnabrug, fubject to its own count: E. long. 7° 20′, N. lat. 52° 21′.

TECHNICAL, expreffes fomewhat relating to arts or fciences: in this fenfe, we fay technical terms.

TE DEUM, the name of a celebrated hymn, ufed in the Chriftian church, and fo called becaufe it begins with thefe words, *Te Deum laudamus*; "We praife thee, O God." It is fung in the Romifh church, with great pomp and folemnity, upon the gaining of a victory, or other happy event.

TEES, a river which rifes on the confines of Cumberland; and running eaftward divides the county of Durham from Yorkfhire, and falls into the German fea below Stockton.

TEFLIS, the capital of Perfian Georgia in Afia, fituated on the river Kur, or Cyrus, three hundred miles north of Tauris, and as many fouth of Aftracan: E. long. 47° 20′, N. lat. 43°.

TEGAPATAN, a port-town of the hither India, in Afia, near Cape Comorin, eighty miles fouth of Cochin, and a hundred and fixty north-weft of Columbo in Ceylon: E. long. 76°, N. lat. 8°.

TEGUMENT, any thing that furrounds or covers another.

TEHAMA, one of the divifions of Arabia Felix in Afia, fituated on the Red-fea, between the provinces of Mecca and Hadramut.

TEINTS and SEMI-TEINTS, in painting, denotes the feveral colours ufed in a picture, confidered as more or lefs high, bright, deep, thin, or weakened, and diminifhed, *&c.* to give the proper relievo, foftnefs, or diftance, *&c.* of the feveral objects.

TEISSE, or TEYS, a river of Hungary, which rifes in the Carpathian mountains; and running from eaft to weft, paffes from Tokay; then turning fouth, paffes by Zolnock and Segedin; and having joined the river Merifh, falls into the Danube, oppofite to Salankamen.

TELAMON, a name given to thofe figures or half figures of men fo commonly ufed, inftead of columns or pilafters, to fupport any member in architecture, as a balcony, or the like.

TELEPHIUM, in botany, a genus of the pentandria trigynia clafs. The calix confifts of five leaves; and the corolla of five petals, inferted into the receptacle; and the capfule has one cell and three valves. The fpecies are two, none of them natives of Britain.

TELE-

TELESCOPE. See Optics, p. 421.

TELESIN, a province of the kingdom of Algiers, in Africa, situated on the confines of the empire of Morocco.

TELLER, an officer of the exchequer, in ancient records called tallier. There are four of these officers, whose duty is to receive all sums due to the king, and to give the clerk of the pells a bill to charge him therewith. They likewise pay all money due from the king, by warrant from the auditor of the receipt; and make weekly and yearly books, both of their receipts and payments, which they deliver to the lord treasurer.

TELLICHERRY, a port-town on the Malabar coast, in the Hither India, thirty miles north of Callicut: E. lon. 75° N. lat. 12°.

TEMESWAER, the capital city of the Bannat of Temeswaer, lately annexed to Hungary, sixty miles north-east of Belgrade: E. long. 22°, N. lat. 45° 55′.

TEMPERAMENT, among physicians, denotes the same with constitution; or a certain habitude of the humours of the human body, whereby it may be denominated hot, cold, moist, dry, bilious, sanguine, phlegmatic, melancholic, *&c.*

TEMPLARS, a religious order instituted at Jerusalem, abouth the year 1118. Some religious gentlemen put themselves under the government of the patriarch of Jerusalem, renounced property, made the vow of celibacy and obedience, and lived like canons regular. King Baldwin assigned them an apartment in his palace. They had likewise lands given them by the king, the patriarch, and the nobility, for their maintenance. At first there were but nine of this order, and the two principal persons were Hugo de Paganis, and Geoffrey of St Omers. About nine years after their institution, a rule was drawn up for them, and a white habit assigned them, by pope Honorius II. About twenty years afterwards, in the popedom of Eugenius III. they had red crosses sewed upon their cloaks, as a mark of distinction; and in a short time they were increased to about three hundred, in their convent at Jerusalem. They took the name of Knights Templars, because their first house stood near the temple dedicated to our Saviour at Jerusalem. This order, after having performed many great exploits against the infidels, became rich and powerful all over Europe; but the knights, abusing their wealth and credit, fell into great disorders and irregularities. Many crimes and enormities being alledged against them, they were prosecuted in France, Italy, and Spain; and at last, the pope, by his bull of the 22d of May 1312, given in the council of Vienna, pronounced the extinction of the order of Templars, and united their estates to the order of St John of Jerusalem.

TEMPLE, a general name for places of public worship, whether pagan, Christian or otherwise. But the word, in a restrained sense, is used to denote the places, or edifices, in which the pagans offered sacrifice to their false gods.

TEMPORAL, a term generally used for secular, as a distinction from ecclesiastical. Thus we say temporal lords, and spiritual or ecclesiastical lords.

TEMPORUM ossa. See Anatomy, p. 155

TENAILLE, in fortification. See Fortification, p. 619.

TENANT, one that holds lands or tenements of some lord, or landlord, by rent, fealty, *&c.* See Tack.

TENBURY, a market-town of Worcestershire, fifteen miles north-west of Worcester.

TENBY, a port-town of Pembrokeshire, situated on Bristol channel: W. long. 4° 45′, N. lat. 51°. 40′.

TENCH, in ichthyology. See Cyprinus.

TENDER, a small ship, in the service of men of war, for carrying of men, provisions, or any thing else that is necessary.

TENDONS, are white, firm, and tenacious parts, continuous to the muscles, and usually forming their extremities. See Anatomy, Part II.

TENEBRÆ, an office in the Romish church, performed on Wednesday, Thurday, and Friday, in Passion-week, at which time neither flowers nor images are allowed to be set upon the altars, but they must be covered with purple.

TENEBRIO, a genus of insects belonging to the order of coleoptera. The last joint of the antennæ is roundish; the breast is somewhat convex, and marginated; and the elytra are hard. There are 33 species, principally distinguished by their colour.

TENEDOS, one of the smallest islands of the Archipelago, situated near the coast of lesser Asia, west of the ruins of Troy, E. long. 27°, N. lat. 39° 30′.

TENEMENT, properly signifies a house; but in a larger sense it is taken for any house, land, rent, or other thing, which a person holds of another.

TENERIF, one of the largest of the Canary Islands, situated in the Atlantic Ocean: W. long. 17°, N. lat. 28. being about 130 miles in circumference. It is a fruitful island, abounding in corn, wine, and oil; though pretty much incumbered with mountains, of which the most remarkable is that called the Pico of Tenerif, being one of the highest mountains in the world, in the form of a sugar-loaf, the white top whereof may be seen at sea upwards of one hundred miles.

TENES, a province of the kingdom of Algiers, in Africa.

TENESMUS, in medicine, a name given, by medical writers, to a complaint which is a continual desire of going to stool, but without any stool being ready to be voided. This is usually attended with some tumour, sometimes with a very considerable one, in the part. This is properly no primary disease, but merely a symptomatic one, and differs in degree according to the disease on which it is an attendant.

TENOR, or Tenour, the purport or content of a writing or instrument in law, *&c.*

Action of proving the Tenor, in Scots law. See Law, Tit. xxx. 22.

Tenor, in musick, the first mean, or middle part, or that which is the ordinary pitch of the voice, when neither raised to a treble, nor lowered to a bass.

TENSE, in grammar, an inflection of verbs, whereby they are made to signify, or distinguish the circumstance of time, in what they affirm. See Grammar.

TENT, in surgery, a roll of lint worked into the shape of a nail, with a broad flat head.

TENTER, a machine used in the cloth-manufacture, to stretch out the pieces of cloth, stuff, *&c.* or only to make them even, and set them square.

It is usually about four feet and a half high, and for length exceeds that of the longest piece of cloth. It consists of several pieces of wood, placed like those which form

form the barriers of a manege; ſo that the lower croſs piece of wood may be raiſed or lowered, as is found requiſite, to be fixed at any height, by means of pins. Along the croſs-pieces, both the upper and under one are hooked nails, called tenter-hooks, driven in from ſpace to ſpace,

TENTHREDO, a genus of inſects belonging to the order of hymenoptera. The mouth is furniſhed with jaws, but has no proboſcis; the wings are plain and tumid; the ſting conſiſts of two ſerrated laminæ, and the ſcutellum of two grains placed at a diſtance. There are 55 ſpecies, principally diſtinguiſhed by their colour, and the figure of the antennæ.

TENURE, in law, ſignifies the manner whereby lands or tenements are held, or the ſervice that the tenant owes to his lord. It likewiſe denotes the eſtate in the land. In England, tenures were anciently divided into the following eſcuage; that is, land held by the ſervice of the ſhield, and thereby the tenant was, at his own expence, obliged to follow his lord into the wars. Knight's ſervice and chivalry; when lands were held of the king, or meſne-lord, to perform ſervice in war. Burgage tenure; land held of the lord of the burrow, at a certain rent. Villenage, otherwiſe termed baſe-tenure; whereby the tenant was bound to do all inferior ſervices, commanded by the lord. Grand ſerjeanty; lands held by honorary ſervices at the king's coronation. Petit ſerjeanty; lands held of the king, to contribute yearly ſome ſmall thing towards his wars. Frankalmoine; that tenure by which lands were held by eccleſiaſtics, in free and perpetual alms. Socage tenure; where lands are held by tenants, to plow their lord's lands, and perform every office of huſbandry, at their own expence. But all theſe ancient tenures and ſervices are in general taken away, and reduced into common and free ſocage. The uſual tenures at preſent are, fee ſimple; which is an abſolute tenure of lands to a man and his heirs for ever. Fee-tail; a limited fee, to a perſon and the heirs of his body begotten. Curteſy tenure; where a man having married a woman ſeiſed in fee, *&c.* has iſſue born alive by her, in which caſe, after her death, the huſband is tenant by the curteſy of England. Tenure in dower; is where a widow holds, for her life, a third part of her huſband's land, whereof he was ſeiſed in fee at any time during the coverture. There is alſo a tenure for life, or years, when lands are held for thoſe terms on reſerved rents. Copyholy tenure, is a holding for lives, or in fee, at the will of the lord, according to the cuſtom of the manor. For the ſeveral kinds of tenure or holding in Scotland, ſee LAW, Tit. xi.

TEPID, a term uſed by writers on mineral waters, *&c.* to expreſs ſuch of them as have a leſs ſenſible cold than common water.

TERCE, in Scots law. See LAW, Tit. xvi. 24.

TERCERA, one of the largeſt of the Azores or weſtern iſlands, ſituated in the Atlantic ocean: W. long. 28°, and N. lat. 39°.

TEREBINTHUS, in botany. See PISTACIA.

TERES, in anatomy. See ANATOMY, p. 195.

TERGOWISCO, the capital of Wallachia, in European Turky, eighty miles ſouth-eaſt of Hermanſtat in Tranſilvania: E. long. 26° 30', N. lat. 45° 35'.

TERM, in general, ſignifies much the ſame with boundary or limit.

TERM, in law, is generally taken for a limitation of time or eſtate: as a leaſe for term of life, or years.

TERM, in grammar, denotes ſome word or expreſſion of a language.

TERM *in the arts*, or TERM *of art*, is a word which, beſides the literal and popular meaning which it has, or may have, in common language, bears a further and peculiar meaning in ſome art or ſcience.

TERMINALIA, in antiquity, feaſts celebrated by the Romans, in honour of the god Terminus.

TERMINATION, in grammar, the ending of a word, or laſt ſyllable thereof.

TERNATE, the moſt northerly of the Molucca or Clove iſlands, in the poſſeſſion of the Dutch.

TERRA. See GEOGRAPHY, and ASTRONOMY.

TERRA FIRMA, in geography, is ſometimes uſed for a continent, in contradiſtinction to iſlands.

TERRA DEL FOGO, an iſland of South-America, from which it is ſeparated by the ſtreights of Magellan.

TERRÆ FILIUS, SON OF THE EARTH, a ſtudent of the univerſity of Oxford, formerly appointed, in public acts, to make jeſting and ſatyrical ſpeeches againſt the members thereof, to tax them with any growing corruptions, *&c.*

TERRACE, a walk or bank of earth, raiſed in a garden or court, to a due elevation, for a proſpect.

TERRAQUEOUS, in geography, an appellation given to our globe, becauſe conſiſting of land and water.

TERRELLA, an appellation given to a loadſtone, when turned into a ſpherical figure, and is placed ſo, that its poles and equator, *&c.* correſpond to the poles and equator of the world; as being a juſt repreſentation of the great magnetical globe which we inhabit.

TERRESTRIAL, ſomething partaking of the nature of earth, or belonging to the globe of the earth: thus we ſay, the terreſtrial globe, *&c.*

TERRIER, a book, or roll, wherein the ſeveral lands, either of a private perſon, or of a town, college, church, *&c.* are deſcribed. It ſhould contain the number of acres, and the ſite, boundaries, tenants names, *&c.* of each piece or parcel.

TERRIER is alſo uſed for a ſmall hound. See CANIS.

TERRITORY, in geography, denotes an extent or compaſs of land, within the bounds, or belonging to the juriſdiction, of any ſtate, city, or other ſubdiviſion of a country.

TERROUEN, a town of Artois, in the French Netherlands, ſituated on the river Lis, ſix miles ſouth of St Omers.

TERTIAN, in medicine. See MEDICINE, p. 61.

TERTIATE *a great gun*, in gunnery, is to examine the thickneſs of the metal at the muzzle, whereby to judge of the ſtrength of the piece, and whether it be ſufficiently fortified. This is uſually done with a pair of caliber-compaſſes; and if the piece be home bored, the diameter leſs by the height, divided by 2, is the thickneſs at any place.

TERVEL, a city of Arragon, in Spain, ſituated on the river Guadalavira, ſeventy-five miles ſouth of Sarragoſſa: W. long. 1° 20', N. lat. 40° 35'.

TESSELATED PAVEMENTS, thoſe of rich Moſaic work, made

made of curious ſquare marbles, bricks, or tiles, called teſſelæ, from their reſembling dice.

TESSIN, a river of Italy, which, taking its riſe in the Alps, runs through the country of the Griſons and the lake Maggior; and then, turning ſouth-eaſt through the Milaneſe, paſſes by Pavia, and falls into the Po, a little below that city.

TEST, a veſſel of the nature of the coppel, uſed for large quantities of metals at once.

Test-liquor, a liquor uſed by dealers in brandies, to prove whether they be genuine, or mixed with home-ſpirits. This liquor is nothing but a green or white vitriol, diſſolved in fair water; for a few drops of it being let fall into a glaſs of old French brandy, will turn the whole to a purple, or fine violet colour; and by the ſtrength or paleneſs of this colour, the dealers judge the brandy to be genuine or mixed, in different proportions, with home-ſpirits.

Test-act, a ſtatute 25 Car. II. cap. 2. which requires all officers, both civil and military, to take the oaths and teſt, *viz.* the ſacrament, according to the rites and ceremonies of the church of England; for the neglect whereof, a perſon executing any office mentioned in that ſtatute, forfeits the ſum of 500 l. recoverable by action of debt.

TESTACEOUS, in natural hiſtory, an epithet given to animals covered with a ſhell, as tortoiſes, oyſters, pearl-fiſh, *&c.*

TESTAMENT. See Law, Tit. xxviii. 2.

TESTATOR, the perſon who makes his will and teſtament.

TESTES, in anatomy. See Anatomy, p. 270.

TESTIMONY. See Evidence.

TESTUDO, in zoology, a genus belonging to the order of amphibia reptilia. It has four legs and a tail, and the body is covered with a ſtrong ſhell. There are 15 ſpecies, principally diſtinguiſhed by peculiarities in their feet. The midas, or common turtle, is found at the Aſcenſion iſle, and many other ſouthern iſlands. The ſhell of this animal is ſo ſtrong, that ſeveral men may ſtand upon it without injury. It lays membranaceous eggs in round holes which it digs in the ſand. The turtle is ſaid to continue ſeveral weeks in the acts of copulation. It grows to a vaſt ſize, ſome having been found to weigh 480 pounds.

The Americans find ſo good account in catching turtle, that they have made themſelves very expert at it: they watch them from their neſts on ſhore, in moon-light nights; and, before they reach the ſea, turn them on their backs, and leave them till morning; when they are ſure to find them, ſince they are utterly unable to recover their former poſture: at other times they hunt them in boats, with a peculiar kind of ſpear, ſtriking them with it through the ſhell; and as there is a cord faſtened to the ſpear, they are taken much in the ſame manner as the whales.

Testudo, in antiquity, was particularly uſed among the poets, *&c.* for the ancient lyre; by reaſon it was originally made by its inventor Mercury, of the black or hollow ſhell of the teſtudo aquatica, or ſea-tortoiſe, which he accidentally found on the banks of the river Nile.

Testudo, in the military art of the ancients, was a kind of cover or ſcreen which the ſoldiers, *e. gr.* a whole company, made themſelves of their bucklers, by holding them up over their heads, and ſtanding cloſe to each other. This expedient ſerved to ſhelter them from darts, ſtones, *&c.* thrown upon them, eſpecially thoſe thrown from above, when they went to the aſſault.

Testudo was alſo a kind of large wooden tower, which moved on ſeveral wheels, and was covered with bullocks hides flead, ſerving to ſhelter the ſoldiers when they approached the walls to mine them, or to batter them with rams.

It was called teſtudo, from the ſtrength of its roof, which covered the workmen as the ſhell does the tortoiſe.

TETANUS, in medicine, a convulſive motion that makes any part rigid or inflexible.

TETHYS, a genus of inſects belonging to the order of vermes molluſca. The body is oblong, fleſhy, and without feet; the mouth conſiſts of a cylindrical proboſcis under the duplicature of a lip; and there are two foramina at the left ſide of the neck. The ſpecies are two, both inhabitants of the ocean.

TETICACO, a great lake of Peru, more than two hundred miles in circumference: the towns ſituated on this lake are eſteemed the moſt delightful in all South America.

TETRACERA, in botany, a genus of the polyandria tetragynia claſs. The calix conſiſts of ſix leaves; and there are four capſules. There is but one ſpecies, a native of America.

TETRACHORD, in the ancient muſick, a concord conſiſting of four degrees or intervals, and four terms or ſounds; called alſo by the ancients diateſſaron, and by us a fourth.

TETRADECARHOMBIS, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, expreſſing a rhomboidal body, conſiſting of fourteen planes.

The characters of this genus are, that the bodies of it are exactly of the ſame form with the common ſelenitæ; but that each of the end-planes is divided into two; and there are, by this means, eight of theſe planes, inſtead of four.

TETRADIAPASON, a muſical chord, otherwiſe called a quadruple diapaſon, or eighth.

TETRADYNAMIA, in botany. See Botany, p. 635.

TETRAEDRON, in geometry, one of the five regular or platonic bodies or ſolids, comprehended under four equilateral and equal triangles.

TETRAGON, in geometry, a general name for any four-ſided figure, as a ſquare, parallelogram, rhombus, or trapezium.

TETRAGONIA, in botany, a genus of the icoſandria pentagynia claſs. The calix conſiſts of four ſegments; it has no corolla; and the drupa has four ſides, and four cells. There are two ſpecies, both natives of Æthiopia.

TETRAGONOTHECA, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is paleaceous; it has no pappus; and the calix conſiſts of one leaf, divided into four plain ſegments. There is but one ſpecies, a native of Virginia.

TETRAGRAMMATON, a denomination given by the Greeks to the Hebrew name of God, Jehovah, becauſe conſiſting of four letters.

TETRANDRIA, in botany. See Botany, p. 635.

TETRAO, in ornithology, a genus of birds, of the order of gallinæ, diſtinguiſhed by having the part of the forehead near the eyes naked and papilloſe. There are 20 ſpecies, diſtinguiſhed principally by their colour, their having rough or naked feet, *&c.*

TETRAPETALOUS, in botany, an epithet given to flowers that consist of four single petals or leaves.

TETRAPHARMACUM, signifies any remedy consisting of four ingredients.

TETRAPTERA, a name given to insects which have four wings.

TETRAPTOTE, in grammar, a name given to such defective nouns as have only four cases; such are *vicis*, *pecudis*, *sordis*, &c. as being deprived of the nominative and vocative singular.

TETRAPYRAMIDIA, in natural history, the name of a genus of spars, influenced in their shape by an admixture of particles of tin, and found in form of broad-bottomed pyramids of four sides.

TETRARCH, a prince who holds and governs a fourth part of a kingdom. Such originally was the import of the title tetrarch; but it was afterwards applied to any petty king or sovereign.

TETRASTYLE, in the ancient architecture, a building, and particularly a temple, with four columns in its front.

TETUAN, a town of the empire of Morocco, situated about eight miles from the bay of that name, just within the straits of Gibraltar: W. long. 6° 35′, N. lat. 35° 40′.

TEUCRIUM, in botany, a genus of the didynamia gymnospermia class. The upper lip of the corolla is bipartite. There are 31 species, four of them natives of Britain, *viz.* the scordium, or water germander, the leaves of which are said to be deobstruent, diuretic, and sudorific; the chamedrys, or germander, the leaves, tops, and seeds of which are said to be sudorific, diuretic, *&c.*; the chamæpitys, or ground pine, the leaves of which are recommended as aperient and vulnerary; and the scorodonia, or wood-sage.

TEUTONIC, something belonging to the Teutons, an ancient people of Germany, inhabiting chiefly along the coasts of the German ocean: thus, the Teutonic language is the ancient language of Germany, which is ranked among the mother tongues. The Teutonic is now called the German or Dutch.

TEUTONIC ORDER, a military order of knights, established towards the close of the twelfth century, and thus called as consisting chiefly of Germans or Teutons. The origin, *&c.* of the Teutonic order, is said to be this. The Christians, under Guy of Lusignan, laying siege to Acre, or Acon, a city of Syria, on the borders of the Holy Land, some Germans of Bremen and Lubec, touched with compassion for the sick and wounded of the army, who wanted common necessaries, set on foot a kind of hospital under a tent, which they made of a ship's sail, and here betook themselves to a charitable attendance on them. This started a thought of establishing a third military order, in imitation of the templars and hospitalers. The design was approved of by the patriarch of Jerusalem, the archbishops and bishops of the neighbouring places, the king of Jerusalem, the masters of the temple and hospital, and the German lords and prelates then in the Holy Land. and pope Calixtus III. confirmed it by his bull, and the new order was called the order of the Teutonic knights of the house of St. Mary at Jerusalem. The pope granted them all the privileges of the Templars and Hospitalers of St. John, excepting that they were to be subject to the patriarchs and other prelates, and that they should pay tithe of what they possessed.

TEWKSBURY, a borough-town of Glocestershire, situated on the river Severn, ten miles north of Glocester. It sends two members to parliament.

TEXEL, an island of Holland, situated at the entrance of the Zuyder-sea, parted from the continent of Holland by a narrow channel, through which most ships bound to Amsterdam pass.

TEXT, a relative term, contradistinguished to gloss or commentary, and signifying an original discourse exclusive of any note or interpretation.

TEXTURE, properly denotes the arrangement and cohesion of several slender bodies or threads interwoven or entangled among each other, as in the webs of spiders, or in cloths, stuffs, *&c.*

THALAMI *nervorum opticorum*. See ANATOMY, p. 286.

THALIA, in botany, a genus of the monandria monogynia class. The corolla consists of five waved petals; and the drupa has a double-celled nucleus. There is but one species, a native of America.

THALICTRUM, in botany, a genus of the polyandria polygynia class. The corolla consists of five petals; it has no corolla; and the seeds are naked. There are 14 species, three of them natives of Britain, *viz.* the flavum, or meadow-rue; the minus, or lesser meadow-rue; and the alpinum, or mountain meadow-rue.

THAMES, a great navigable river of England, composed chiefly of the river Isis and Thame; of which the Isis is much the largest, and runs the longest course, rising on the confines of Glocestershire. At Lechlade it becomes navigable, from whence it continues its course north-east to oxford, where it receives the Charwell; from Oxford it runs south-east to Abington, and so to Dorchester, where it receives the Thame, and continues its course south-east to Windsor, and thence runs east to London, and continues the same course to the sea, receiving the river Medway near the mouth of it. The Thame is but a small river, which rising near Tring in Hertfordshire, crosses the county of Bucks, and falls into the Isis at Dorchester.

THANE, or THAIN, a name of an ancient dignity among the English and Scots, or Anglo-Saxons. Skene makes thane to be a dignity equal to the son of an earl. Camden will have it, that thanes were only dignified by the offices they bore. There were two kinds or orders of thanes; the king's thanes, and the ordinary thanes. The first were those who attended the king in his courts, and who held lands immediately of the king. The ordinary thanes, or the *thani minores*, were the lords of the manors, who had particular jurisdiction within their limits, and over their own tenants; these changed their names for that of barons, and hence their courts are called courts-baron to this day.

THANET, a little island of east Kent, formed by the branches of the Stour and the sea.

THAPSIA, in botany, a genus of the pentandria digynia class. The fruit is oblong, and surrounded with a membrane. There are four species, none of them natives of Britain.

THAWING, the resolution of ice into its former fluid state, by the warmth of the air, *&c.* See FREEZING.

THEA in botany See TEA.

THEATINES, a religious order in the Romish church, so called

called from their principal founder John Peter Caraffa, then biſhop of Theate, or Chiete, in the kingdom of Naples, and afterwards pope, under the name of Paul IV. The names of the other founders were Gaetan, Boniface, and Conſiglieri. Theſe four pious men, deſiring to reform the eccleſiaſtical ſtate, laid the foundation of an order of regular clerks at Rome, in the year 1524. Pope Clement VII. approved the inſtitute, and permitted the brethren to make the three religious vows, to elect a ſuperior every three years, and to draw up ſtatutes for the regulation of the order. They firſt endeavoured, by their example, to revive among the clergy the poverty of the apoſtles and firſt diſciples of our Saviour, and were the firſt who aſſumed the title of regular clerks.

THEATRE, a public edifice for the exhibiting of ſcenic ſpectacles, or ſhews, to the people; comprehending not only the eminence on which the actors appear, and the action paſſes, but alſo the whole area of the place common to the actors and ſpectators.

THEBAID, a celebrated heroic poem of Statius, the ſubject whereof is the civil war of Thebes, between the two brothers Eteocles and Polynices; or, Thebes taken by Theſeus.

THEBES, the name of an ancient city in upper Egypt, now in ruins; as alſo an ancient city of Achaia, now a province of European Turky.

THEFT. See LAW, Tit. xxxiii. 28.

THEISM. See DEISM.

THELEGONUM, in botany, a genus of the monœcia polyandria claſs. The calix both of male and female conſiſts of two ſegments; neither of them have any corolla; the ſtamina are 12; and the female has one ſtylus, and a coriaceous capſule, with one cell and one ſeed. There is but one ſpecies, a native of Italy.

THEME, denotes the ſubject of an exerciſe, for young ſtudents to write or compoſe on.

THENAR, in anatomy. See ANATOMY, p. 200.

THEOBROMA, the CHOCOLATE-NUT-TREE, in botany, a genus of the polyadelphia pentandria claſs. The corolla conſiſts of five petals; the nectarium is bell-ſhaped; and the fruit is a woody cortex, of an unequal ſurface, with five ridges. There are two ſpecies, both natives of America.

THEOCRACY, in matters of government, a ſtate governed by the immediate direction of God alone: ſuch was the ancient government of the Jews, before the time of Saul.

THEODOLITE, a mathematical inſtrument much uſed in ſurveying. See GEOMETRY, p. 701.

THEOGONY, that branch of the heathen theology, which taught the genealogy of their gods.

THEOLOGY. See RELIGION.

THEOPHRASTA, in botany, a genus of the pentandria monogynia claſs. The corolla is bell-ſhaped, with obtuſe ſegments; and the capſule has one round large cell, and one ſeed. There is but one ſpecies, a native of America.

THEOREM, a ſpeculative propoſition, demonſtrating the properties of any ſubject.

THEORETIC, ſomething relating to theory, or that terminates in ſpeculation. See THEORY.

THEORY, in general, denotes any doctrine which terminates in ſpeculation alone, without conſidering the practical uſes and application thereof.

THERAPEUTÆ, a term applied to thoſe who are wholly employed in the ſervice of religion. This general term has been applied to particular ſects of men, concerning whom there have been great diſputes among the learned.

THERAPEUTICS, that part of medicine which acquaints us with the rules that are to be obſerved, and the medicines to be employed in the cure of diſeaſes.

THERAPHIM, certain images, or ſuperſtitious figures, mentioned in ſcripture. Some Jewiſh writers tell us, the theraphim were effigies of human heads, placed in niches, and conſulted as oracles. Others ſay, they were taliſmans, or figures of metal, caſt and engraved under certain aſpects of the planets; to which they aſcribed extraordinary effects.

THERIACA ANDROMACHI, a compound medicine, made in the form of an electuary.

THERMÆ, artificial hot baths, much uſed by the Romans.

THERMOMETER, an inſtrument for meaſuring the increaſe and decreaſe of the heat and cold of the air, by means of the elaſtic and expanſive power of bodies of the fluid ſort. See PNEUMATICS, p. 486.

THESEA, in antiquity, feaſts celebrated by the Athenians, in honour of Theſeus, conſiſting of ſports and games, with mirth and banquets: ſuch as were poor, and unable to contribute to them, were entertained at the public expence.

THESIS, a general poſition which a perſon advances, and offers to maintain. In colleges it is frequent to have placards, containing a number of them, in theology, in medicine, in philoſophy, in law, *&c.*

THESIUM, in botany, a genus of the pentandria monogynia claſs. The calix conſiſts of one leaf, into which the ſtamina are inſerted; there is but one ſeed. The ſpecies are ſeven, only one of them, *viz.* the linophyllon, or baſtard toad-flax, a native of Britain.

THESSALY, now called Janna, a province of European Turkey, bounded by Macedonia, on the north; by the Archipelago, on the eaſt; by Achaia, or Livadia, on the ſouth; and by Epirus, on the weſt.

THETFORD, the county-town of Norfolk, ſituated twenty-five miles ſouth-weſt of Norwich. It ſends two members to parliament.

THEURGY, a name given to that part of magic called white magic, or the white art. Thoſe who have written of magic have divided it into three kinds: the firſt is theurgy, as operating by divine means: the ſecond, natural magic, performed by the powers of nature: and the third, necromancy, which they imagined proceeded from invoking dæmons.

THIBET, one of the moſt powerful of the Tartar kingdoms, having China on the eaſt, and India on the weſt.

THIGH, in anatomy. See ANATOMY, p. 182, 203.

THIMBLE, an inſtrument made of braſs, ſilver, iron, *&c.* put on the finger to thruſt a needle through any cloth, ſilk, *&c.* uſed by all ſeamſtreſſes, taylors, *&c.*

THINKING, a general name for any act or operation of the mind. See LOGICK, and METAPHYSICS.

THIRLAGE. See LAW, Tit. xvi. 12.

THIRSK, a borough-town in the north-riding of Yorkſhire,

ſhire, ſituated on the river Swale, ſixteen miles north-weſt of York. It ſends two members to parliament.

THIRST, an uneaſy ſenſation, ariſing from a deficiency in the ſaliva to moiſten the inward parts of the mouth; hence ariſes a ſtrong deſire for drink: it is a ſymptom generally attending feveriſh diſorders.

THISTLE, in botany. See CARDUUS.

Order of the THISTLE, or *of St* ANDREW, a military order of knighthood in Scotland, the riſe and inſtitution whereof is variouſly related by different authors. Leſley, biſhop of Roſs, reports, that the night before the battle between Athelſtan king of Northumberland, and Hungus king of the Picts, a bright croſs, in form of that whereon St Andrew (the tutelar ſaint of Scotland) ſuffered martyrdom, appeared to Hungus; who having gained the victory, ever after bore the figure of that croſs on his banners. Others aſſert, that Achaius king of Scotland firſt inſtituted this order, after having made the famous league offenſive and defenſive with Charlemagne king of France. But although the thiſtle had been acknowledged as the ſymbol of the kingdom of Scotland from the reign of Achaius, yet ſome refer the beginning of this order to Charles VII. of France. Others place the foundation of it as low as the year 1500.

The chief and principal enſign is a gold collar compoſed of thiſtles and ſprigs of rue interlinked with amulets of gold, having pendent thereunto the image of St Andrew with his croſs, and the motto, NEMO ME IMPUNE LACESSET.

The ordinary or common enſign worn by the knights, is a ſtar of four ſilver points, and over them a green circle, bordered and lettered with gold, containing the ſaid motto, and in the centre is a thiſtle proper; all which is embroidered on their left breaſt, and worn with the collar, with a green ribband over the left ſhoulder, and brought under the right arm; pendent thereto is the image of St Andrew, with his croſs, in a purple robe, within an oval of gold enamelled vert, with the former motto: but ſometimes they wear, encircled in the ſame manner, a thiſtle crowned.

About the time of the reformation, this order was dropped, till James II. of England reſumed it, by creating eight knights: however, the revolution unſettled it again, and it lay neglected till queen Anne, in 1703, reſtored it to the primitive deſign, of twelve knights of St Andrew.

THLASPI, in botany, a genus of the tetradynamia ſiliculoſa claſs. The pod is emarginated, heart-ſhaped, containing many ſeeds. There are ten ſpecies, ſix of them natives of Britain, *viz.* the campeſtre, or mithridate; the arvenſe, or treacle-muſtard; the perfoliatum, or perfoliate treacle-muſtard; the furtum, or perennial mithridate muſtard; the montanum, or mountain mithridate-muſtard; and the burſa paſtoris, or ſhepherd's purſe.

THOMÆANS, THOMISTS, or *Chriſtians of St* THOMAS, a people of the Eaſt-Indies, who, according to the tradition, received the Goſpel from St Thomas. Upon the arrival of the Portugueſe at Calicut, in their firſt voyage to the Indies, they met with ancient Chriſtians, who pretended to be deſcended from thoſe converted by St Thomas. The Thomæans being informed of a new people arrived among them, who bore a particular veneration for the croſs, ſent embaſſadors to them, to make an alliance with them, and to ſollicit their aſſiſtance againſt the Gentile princes, by whom they were greatly oppreſſed. A mixture of opinions, with a total interruption of paſtors, ſometimes for ſeveral years together, occaſioned that horrible chaos their religion was in at the arrival of the Portugueſe; for a ſpecimen whereof we ſhall add their manner of celebrating the euchariſt: Over their altar was a kind of gallery; and while the prieſt was ſaying the beginning of the office below, a cake of flour of rice was frying in oil, or butter, above; when enough, the cake was let down in a baſket upon the altar, where the prieſt conſecrated it: as to the other ſpecies, for wine they uſed a kind of brandy or arrack, variouſly prepared in that country. Nor was their ordination much more regular; the archdeacon, who was ſometimes more reſpected than the biſhop himſelf, frequently ordained prieſts: their other abuſes were infinite. The Portugueſe, for theſe two laſt centuries, have laboured the reformation of this church, and have employed both the eccleſiaſtic and ſecular power therein: for this end they have called the Thomæan biſhops to the council at Goa, have inſtructed, charged them, *&c.* and even ſent them for inſtruction to Portugal and Rome; but finding that they were ſtill apt to relapſe at their return, and that no good was like to be done with them, they reſolved to exclude them once for all, and to appoint an European biſhop in their room. Theſe proceedings have rendered the Portugueſe infinitely odious to the Thomæans.

St THOMAS, a city of the hither India, on the coaſt of Coromandel, three miles ſouth of Fort St George; ſubject to the Portugueſe.

St THOMAS is alſo an iſland in the Atlantic ocean, ſituated under the equator, in 8° E. long.

St THOMAS is alſo a town of Guiana, in South America; ſituated on the river Oronoko; ſubject to Spain.

St. THOMAS'S DAY, a feſtival of the Chriſtian church, obſerved on Dec. 21. in commemoration of St Thomas the apoſtle.

St THOMAS *of Canterbury's day,* a feſtival of the Romiſh church, obſerved on Dec. 29. in memory of Thomas Becket archbiſhop of Canterbury, who was murdered, or, as the Romaniſts ſay, martyred, in the reign of king Henry II.

THOMISM, the doctrine of St Thomas Aquinas, and his followers the Thomiſts, chiefly with regard to predeſtination and grace. There is ſome doubt what the true genuine thomiſm is, but there are authors who diſtinguiſh the thomiſm of St Thomas from that of the dominicans. Others again make thomiſm no other than a kind of janſeniſm diſguiſed: but janſeniſm, it is known, has been condemned by the popes, which pure thomiſm never was: in effect, the writings of Alvarez and Lemos, who were appointed by their order to lay down and defend, before the holy ſee, the dogmata of their ſchool, have ſince been reputed the rule of pure thomiſm.

THOMISTS, a ſect of ſchool-divines, who maintain thomiſm. See the preceding article.

THORACIC DUCT. See ANATOMY, p. 282.

THORAX, in anatomy. See ANATOMY, p. 277.

THORN, a city of Poland, in the province of regal Pruſſia, ſituated on the river Viſtula: E. long. 19°, and N. lat. 52° 40′.

THORN-

THORNBACK, in ichthyology. See RAIA.

THORNBURY, a market-town of Glocesterſhire, ſituated twenty miles ſouth-weſt of Glocester.

THORNEY-ISLAND, an iſland made by the branches of the Thames formerly, where Weſtminſter-abbey now ſtands.

THORNEY-ISLAND is alſo an iſland ſituated in a bay of the Eaſt channel, between Chicheſter and Portſmouth.

THOUGHT, a general name for all the ideas conſequent on the operations of the mind, and even for the operations themſelves.

THOULON, or TOULON, a port-town of Provence, in France, ſituated on a bay of the Mediterranean ſea: E. E. long. 6°, and N. lat. 43° 5′.

THOULOSE, or TOULOSE, a city of France, capital of the city of Languedoc, ſituated on the river Garonne: E. long. 1° 5′, and N. lat. 43° 40′.

THRACE, a province of European Turky, ſituated on the north ſide of the Propontis.

THRASHING, or THRESHING, in agriculture, the art of beating the corn out of the ears.

There are two ways of ſeparating corn from the ear; the firſt by beating it with a flail, which is properly what is called thraſhing. The other method, ſtill practiſed in ſeveral countries, is to make mules, or horſes, trample on it, backwards and forwards; this is properly what the ancients called tritura and trituratio. The Hebrews uſed oxen therein, and ſometimes yoked four together for this purpoſe. Another way among the ancients was with a kind of ſledge, made of boards joined together, and loaden with ſtones or iron, upon which a man was mounted, and the whole drawn over the corn by horſes: this inſtrument was called traha, or tribula.

THRAVE *of corn*, twenty-four ſheaves, or four ſhocks of ſix ſheaves to the ſhock; though, in ſome countries, they only reckon twelve ſhocks to the thrave.

THRICHECHUS, in zoology, a genus of quadrupeds belonging to the order of bruta. There are no fore-teeth in either jaw; the dog-teeth in the upper jaw are ſolitary; the lips are doubled; and in place of the two hind legs, they have a broad fleſhy tail or fin. There are two ſpecies, *viz.* 1. The roſmarinus, morſe, ſea-horſe, or wall-roſe, has the dog-teeth of the upper-jaw protruded out of the mouth. This animal is found in the ocean, within the polar circle. It grunts like a hog, and is about the ſize of a bull. 2 The monatus, or ſea-cow, has the dog-teeth not protruded. It is found in the American and Indian ocean, principally at the mouths of rivers. It feeds upon ſea-weeds, and is about twelve feet long. The females have, between the pectoral fins, two large, round, and fair breſts; and both ſexes have the parts of generation, and the navel, perfectly reſembling thoſe of the human ſpecies: there is no doubt but all the fables concerning mermaids, mermen, and ſyrens, took their riſe from an imperfect view of this animal.

THRIPS, a genus of inſects belonging to the order of hemiptera. The beak is obſcure; the feelers are of an equal length with the breaſt; the body is linear; and it has four ſtrait wings lying croſs-ways upon the back. There are five ſpecies, diſtinguiſhed by their colour.

THROAT, the anterior part of an animal, between the head and the ſhoulders, wherein is the gullet.

THRONE, a royal ſeat, or chair of ſtate, enriched with ornaments of architecture and ſculpture, raiſed on one or more ſteps, and covered with a kind of canopy. Such are the thrones in the rooms of audience of kings and other ſovereigns.

THROWSTER, one who prepares raw ſilk for the weaver, by cleanſing and twiſting it.

THRUSH, in ornithology. See TURDUS.

THULE, of the ancients, ſuppoſed to be the iſlands of Orcades.

THUMB, in anatomy, one of the parts or extremities of the hand. See ANATOMY, p. 181.

THUMMIM. See URIM.

THUNDER, a noiſe in the regions of the air, excited by ſudden flaſhes of lightning. See ELECTRICITY, p. 480, 484.

THURINGIA LANDGRAVIATE, one of the diviſions of the circle of Upper Saxony, in Germany, having the duchy of Magdeburg on the north, and Franconia on the ſouth.

THURSDAY, the fifth day of the Chriſtian week, but the ſixth day of that of the Jews.

THURSO, a port-town of Caithneſs, in Scotland, ſituated on the Caledonian ocean, fifteen miles ſouth-weſt of Dungſby-head.

THUYA, in botany, a genus of the monœcia monadelphia claſs. The calix of the male is an amentum, that of the female a ſtrobilus; neither of them have any corolla; there is one piſtillum, and one nut ſurrounded with an emarginated wing. The ſpecies are three, all natives of warm countries.

THYMUS, in botany, a genus of the didynamia gymnoſpermia claſs. The calix is bilabiated, and the faux is ſhut up with hairs. There are eight ſpecies, two of them natives of Britain, *viz.* the ſerpillum, or common thyme; and the acinos, or wild baſil.

THYMUS, in anatomy. See ANATOMY, p. 278.

THYROARYTÆNOIDES, in anatomy. See ANATOMY, p. 301.

THYROIDE CARTILAGE. See ANATOMY, p. 300.

THYRSUS, in antiquity, the ſceptre which the poets put into the hand of Bacchus. And wherewith they furniſhed the menades in their bacchanalia.

TIARA, an ornament or habit wherewith the ancient Perſians covered their head; and which the Armenians, and kings of Pontus, ſtill wear on medals; theſe laſt, becauſe deſcended from the Perſians.

TIARA is alſo the name of the pope's triple crown.

TIBER, a great river of Italy, which runs through the pope's territories, paſſing by Perugia and Orvietto; and having viſited Rome, falls into the Tuſcan ſea at Oſtia, fifteen miles below that city.

TIBIA, in anatomy. See ANATOMY, p. 183.

TIBIALIS, in anatomy. See ANATOMY, p. 209.

TIDES. See ASTRONOMY, p. 473.

TIDE-WAITERS, or TIDESMEN, are inferior officers belonging to the cuſtom-houſe, whoſe employment it is to watch or attend upon ſhips, until the cuſtoms be paid: they get this name from their going on board ſhips, on their arrival in the mouth of the Thames or other port, and ſo come up with the tide.

TIEND, in Scots law. See LAW, Tit. xvii. 1, *&c.*

TIERCE, or TEIRCE, a meaſure of liquid things, as wine, oil, *&c.* containing the third part of a pipe, or forty-two gallons.

TIERCED, in heraldry, denotes the ſhield to be divided by any part of the partition-lines, as party, coupy, tranchy, or tailly, into three equal parts of different colours or metals.

TIGER, in zoology. See FELIS.

TIGRIS, a large river of Turky in Aſia, which, riſing in the mountains of Armenia, runs ſouthward, dividing Diarbeck or Meſopotamia, from Curdeſtan or the ancient Aſſyria; and having paſſed by Badgat, joins the Euphrates in Eyraca Arabic, or the ancient Chaldea.

TILBURY, a fortreſs in the county of Eſſex, ſituated on the river Thames, oppoſite to Graveſend, twenty miles eaſt of London.

TILIA, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of five petals, and the calix of five ſegments; the berry is dry, and round, with five cells, and five valves. There are two ſpecies, only one of them, *viz.* the Europæa, or lime-tree, a native of Britain.

TILLÆA, in botany, a genus of the tetrandria tetragynia claſs. The calix conſiſts of three ſegments, and the corolla of three equal petals; and there are three capſules containing three ſeeds. The ſpecies are two, none of them natives of Britain.

TILLANDSIA, in botany, a genus of the hexandria monogynia claſs. The calix conſiſts of three perſiſtent ſegments; the corolla is bell-ſhaped, with three ſegments; the capſule has one cell, containing a ſingle pappous ſeed. There are nine ſpecies, none of them natives of Britain.

TILLER *of a ſhip*, a ſtrong piece of wood faſtened in the head of the rudder, and in ſmall ſhips and boats called the helm.

TILLAGE. See AGRICULTURE, p. 54.

TIMAR, a tract or portion of land, which the grand ſegnior grants to a perſon on condition of ſerving him in a war on horſe-back. Hence, thoſe who enjoy ſuch lands are called timariots.

TIMBER, includes all kinds of felled and ſeaſoned woods.

TIME, a ſucceſſion of phænomena in the univerſe; or a mode of duration marked by certain periods or meaſures, chiefly by the motion and revolution of the ſun. See ASTRONOMY, p. 489.

TIME, in muſick, is an affection of ſound, whereby we denominate it long or ſhort, with regard to its continuance in the ſame degree of time. See MUSICK.

TIMOR, and iſland in the Indian ocean, ſituated between 122° and 126° of eaſt long, and between 8° and 10° ſouth lat.

It is in poſſeſſion of the Dutch, and ſaid to have gold mines.

TIN. See CHEMISTRY, p. 83, 105, 135.

TINCTURE, in pharmacy and chemiſtry, a ſeparation of the finer and more volatile parts of a mixed body, made by means of a proper menſtruum diſſolving and retaining the ſame.

TINCTURE, in heraldry, the hue or colour of any thing in coat armour, under which denomination may be alſo included the two metals, or and argent, becauſe they are often repreſented by yellow and white.

TINE. There are two rivers of this name; the one called North-Tine, which riſes on the borders of Scotland; and the other South-Tine, which riſes on the confines of Cumberland; the one running ſouth-eaſt, and the other north-eaſt: they unite their waters at Hexham, and continuing to run eaſt, divide the counties of Durham and Northumberland, paſſing by Newcaſtle, and falling into the German ſea at Tinmouth.

TINMOUTH, a port-town of Northumberland, ſituated on the German ſea, at the mouth of the river Tine, ſeven miles eaſt of Newcaſtle.

TINNING, the covering or lining any thing with melted tin, or with tin reduced to a very fine leaf. Looking-glaſſes are foliated, or tinned, with thin plates of beaten tin, the whole bigneſs of the glaſs, applied or faſtened thereto by means of quickſilver.. See FOLIATING.

TINNITUS AURIUM. See MEDICINE, p. 156.

TINUS, in botany, a genus of the enneandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; the berry has three cells, containing one ſeed. There is but one ſpecies, a native of Jamaica.

TIPPERARY, a county of Ireland, in the province of Munſter, lying between King's-county on the north, and Waterford on the ſouth.

TIPSTAFF, an officer who attends the judges with a kind of ſtaff tipt with ſilver, and takes into his charge all priſoners who are committed or turned over at a judge's chambers.

TIRE, in the ſea-language, is a row of cannon placed along a ſhip's ſide, either above upon deck, or below, diſtinguiſhed by the epithets of upper and lower tires.

TIROL, a country of Germany, in the circle of Auſtria, about one hundred and twenty miles long, and ſixty broad, ſubject to the houſe of Auſtria: it is bounded by Swabia and Bavaria on the north.

TITANS, in the heathen mythology, the offſpring of Titan, the elder brother of Saturn; upon whom, and his ſon Jupiter, they made war, in order to recover the ſovereignty of which Titan had been deprived. The poets repreſent them as a race of giants, ſprung from the earth, and invading heaven; and tell us, that Jupiter overcame them with thunder, and drove them down to the very bottom of hell.

TITHES. See TIEND.

TITLE, an appellation of dignity or quality, given to princes, and other perſons of diſtinction.

TITMOUSE, in ornithology. See PARUS.

TITUBATION, a kind of libration, or ſhaking, which the ancient aſtronomers attributed to the cryſtalline heavens, in order to account for certain irregularities which they obſerved in the motions of the planets.

TITULAR, denotes a perſon inveſted with a title, in virtue of which he holds an office or benefice, whether he perform the functions thereof or not.

TINERTON, a borough of Devonſhire, ſituated on the river Ex, thirteen miles north of Exeter. It ſends two members to parliament.

TIVIOT, or CHEVIOT-MOUNTAINS, are high hills on the borders of England and Scotland.

TMESIS, in grammar, a figure whereby a compound word is ſeparated into two parts, and one or more words placed between them: thus, for *quæcunqnæ*, Virgil ſays, *quæ me cunque vocant terræ*, &c.

TOAD, in zoology. Ses RANA.

TOAD-FLAX, in botany. See ANTIRRHINUM.

TOBACCO, in botany. See NICOTIANA.

TOBAGO, a ſmall iſland in the bay of Panama, in South-

South-America, ſituated W. long 82°, N. lat. 8°.

Tobago, is alſo the name of one of the Caribbee iſlands.

TOBOLSKI, the capital of Siberia, ſituated at the confluence of the rivers Tobal and Iris: E. long. 63°, N. lat. 57° 30′.

TOCAT, the capital of Amaſia, in Aſia: E. long. 37°, and N. lat. 41° 30′.

TOCKAY, a city of Hungary, ſeventy miles north-eaſt of Buda, the wines of which are eſteemed the beſt in Europe.

TOES. See Anatomy, p. 188.

TOGA, in Roman antiquity, a wide woolen gown, or mantle; which ſeems to have been of a ſemi-circular form, without ſleeves; differing both in richneſs and largeneſs, according to the circumſtances of the wearer, and uſed only upon occaſion of appearing in public.

Every body knows that the toga was the diſtinguiſhing mark of a Roman: hence, the jus togæ, or privilege of the toga, was the ſame with the privilege of a Roman citizen, *i. e.* the right of wearing a Roman habit, and of taking, as they explain it, fire and water through the Roman empire.

TOILS, ſnares or nets uſed by hunters for catching wild beaſts, as deer, *&c.*

TOILET, a fine cloth of linen, ſilk, or tapeſtry, ſpread over the table in a bed-chamber or dreſſing room, to undreſs and dreſs upon.

TOISE, a French meaſure containing ſix of their feet; or a fathom.

TOLEDO, a city of New Caſtile, in Spain; the archbiſhop of which is primate of Spain, *&c.* and poſſeſſes the largeſt revenue of any archbiſhop of Europe: it is ſituated in W. long. 4° 12′, and N. lat. 39° 45′.

TOLEN, the capital of an iſland of the ſame name, in the province of Zealand, in the united Netherlands, ſituated four miles north-weſt of Bergenopzoom.

TOLERATION, in matters of religion, is either civil or eccleſiaſtical. Civil toleration, is an immunity and ſafety granted by the ſtate to every ſect that does not maintain doctrines inconſiſtent with the public peace; and eccleſiaſtical toleration, is the allowance which the church grants to its members to differ in certain opinions not reputed fundamentals.

TOLLENON, among the Romans, a warlike machine, formed in this manner: One beam was fixed very deep in the earth, and on the top of it another more than twice as long, and moveable upon a centre; on one end of this croſs-beam were placed a covering of hurdles or planks, within which a few ſoldiers were put, and by pulling down the other end with ropes, theſe were raiſed above the walls of a beſieged town.

TOLU, a port-town of Terra Firma, ſituated on a bay of the North-Sea, an hundred miles ſouth-weſt of Carthagena.

TOLUIFERA, in botany, a genus of the decandria monogynia claſs. The calix is bell-ſhaped, and has five ſegments; the corolla has five petals, the loweſt being longeſt, and ſomewhat cordated; it has no ſtylus. There is but one ſpecies, a native of America.

TOMB, includes both the grave or ſepulchre wherein a defunct is interred, and the monument erected to preſerve his memory.

TOME, in matters of literature, denotes a bound book, or writing that juſt makes a volume.

TOMENTUM, among botaniſts, the downy matter which grows on the leaves of ſome plants.

TONE, or Tune, in muſick, a property of ſound, whereby it comes under the relation of grave and acute; or it is the degree of elevation a ſound has, from the degree of ſwiftneſs of the vibrations of the part of ſonorous bodies. See Musick.

TONGUE, in anatomy. See Anatomy, p. 304.

TONQUIN, a kingdom of the further India, bounded by the provinces of Yunam and Canton, in China, on the north; by Cochin China, on the ſouth; and by the kingdom of Laos, on the weſt; lying between 101° and 108° E. long. and between 17° and 26° N. lat. Its capital is Keccio, or Cachao.

TONSILS, in anatomy. See Anatomy, p. 303.

TONSURE, in eccleſiaſtical hiſtory, a particular manner of ſhaving or clipping the hair of eccleſiaſtics or monks.

The ancient tonſure of the clergy was nothing more than polling the head, and cutting the hair to a moderate degree, for the ſake of decency and gravity: and the ſame obſervation is true, with reſpect to the tonſure of the ancient monks. But the Romaniſts have carried the affair of tonſure much farther; the candidate for it kneeling before the biſhop, who cuts the hair in five different parts of the head, *viz.* before, behind, on each ſide, and on the crown.

TOOL, among mechanics, denotes in general any ſmall inſtrument, uſed as well for making other more complex inſtruments and machines, as in moſt operations in the mechanic arts.

TOOTH, in anatomy. See Anatomy, p. 164.

Tooth ach. See Medicine, p. 120.

TOPARCHY, a little ſtate or ſeigniory, conſiſting only of a few cities or towns: or a petty country, governed and poſſeſſed by a toparch or lord.

TOPAZ, in natural hiſtory, a gem called by the ancients chryſolite, as being of a gold-colour.

The topaz, when perfect and free from blemiſhes, is a very beautiful and valuable gem; it is, however, very rare in this ſtate. It is of the number of thoſe gems which are found only in the round or pebble form, there never having been yet ſeen a true and genuine topaz of a columnar figure, though the far greater part of what our jewellers call ſuch, are in that form. The greateſt part of the true topazes are no larger than grains of a coarſe ſeed; among theſe there are, however, ſome met of the ſize of a pea, and ſome much larger, though thoſe are very rare. It is of a roundiſh or oblong figure in its native or rough ſtate, and is uſually flatted on one ſide, and is generally of a bright and naturally poliſhed ſurface, tolerably tranſparent. They are ever of a fine yellow colour; but they have this, like the other gems, in ſeveral different degrees: the fineſt of all are of a true and perfect gold colour; but there are ſome much deeper, and others extremely pale, ſo as to appear ſcarce tinged. The oriental topaz is equal to the ruby in hardneſs, and is ſecond only to the diamond in luſtre.

TOPHUS, in medicine, denotes a chalky or ſtony concretion in any part of the body, as the bladder, kidney, *&c.* but eſpecially in the joints.

TOPICAL MEDICINES, are the ſame with external ones, or thoſe applied outwardly to ſome diſeaſed and painful part: ſuch are plaſters, cataplaſms, unguents, &c.

TOPOGRAPHY, a deſcription or draught of ſome particular place, or ſmall track of land; as that of a city or town, manor or tenement, field, garden, houſe, caſtle, or the like; ſuch as ſurveyors ſet out in their plots, or make draughts of, for the information and ſatisfaction of the proprietors.

TORBAY, a fine bay in the Engliſh channel, a little eaſt of Dartmouth.

TORCELLA, a port town of Catalonia, in Spain, ſituated at the mouth of the river Ter, in E. long. 2° 50′, and N. lat. 42°.

TORCH, a luminary uſed in ſeveral church-ceremonies, funerals, &c. and more uſually called flambeau.

TORCH-THISTLE, in botany. See CACTUS.

TORDYLIUM, in botany, a genus of the pentandria digynia claſs. The radii of the corolla are all hermaphrodites; the fruit is roundiſh, with a crenated edge; and the involucra are long, and undivided. There are ſeven ſpecies, only two of them natives of Britain, *viz.* the latifolium, or purple-flowered great baſtard parſley; and the nodoſum, or knotted parſley.

TORUS, in architecture, a large round moulding, uſed in the baſes of columns.

TORIES, in the hiſtory of England, a faction or party, oppoſed to the whigs. See WHIGS.

The tories are great ſticklers for the prerogative of the crown, as the whigs are for the liberties and privileges of the people; though, in truth, the principles of the moderate people of both parties do not greatly differ.

TORMENTILLA, in botany, a genus of the icoſandria polygynia claſs. The calix conſiſts of eight ſegments, and the corolla of four petals; the ſeeds are roundiſh, naked, and fixed to a ſmall dry receptacle. There are two ſpecies, both natives of Britain, *viz.* the erecta, or tormentil; and the reptans, or creeping tormentil.

Tormentil-root has an auſtere ſtyptic taſte, accompanied with an aromatic flavour: it is one of the moſt agreeable and efficacious vegetable aſtringents.

TORNADO, a ſudden and vehement guſt of wind from all points of the compaſs, frequent on the coaſt of Guinea.

TORNE, the capital of Torne Lapmark, a province of Sweden, ſituated at the mouth of the river Torne, at the bottom of the Bothnic gulph, upon a little iſland made by the river, four hundred miles north of Stockholm: E. long. 22° 45′, N. lat. 65° 45′.

TORPEDO, in ichthyology. See RAJA.

TORQUE, in heraldry, denotes a round roll of cloth, twiſted and ſtuffed: ſuch is the bandage, frequently ſeen in armories, about the heads of moors, &c.

TORREFACTION, in chemiſtry, is the roaſting or ſcorching of a body by the fire, in order to diſcharge a part either unneceſſary or hurtful in another operation; as ſulphur is thus diſcharged from an ore, before the metal can be obtained to advantage.

TORRENT, denotes a temporary ſtream of water, falling ſuddenly from mountains, whereon there have been great rains, or an extraordinary thaw of ſnow.

TORRICELLIAN EXPERIMENT, a famous experiment made by Toricelli, a diſciple of the great Galileo, which has been already explained in the Treatiſe of PNEUMATICS, p. 485.

TORRINGTON, a market-town of Devonſhire, ſituated on the river Towbridge, twenty ſix miles north-weſt of Exeter.

TORTOISE, in zoology. See TESTUDO.

TORTURE, a grievous pain inflicted on a criminal, or perſon accuſed, to make him confeſs the truth.

TOTNESS, a borough-town of Devonſhire, twenty-three miles ſouth-weſt of Exeter. It ſends two members to parliament.

TOUCAN, in ichthyology. See RAMPHASTOS.

TOUCAN, in aſtronomy, p. 487.

TOUCH-NEEDLE, among aſſayers, refiners, &c. little bars of gold, ſilver, and copper, combined together in all the different proportions and degrees of mixture; the uſe of which is to diſcover the degree of purity of any piece of gold or ſilver, by comparing the mark it leaves on the touch-ſtone with thoſe of the bars.

The metals uſually tried by the touch-ſtone, are gold, ſilver, and copper, either pure, or mixed with one another in different degrees and proportions, by fuſion. In order to find out the purity or quantity of baſer metal in theſe various admixtures, when they are to be examined they are compared with theſe needles, which are mixed in a known proportion, and prepared for this uſe. The metals of theſe needles, both pure and mixed, are all made into laminæ or plates, one twelfth of an inch broad, and of a fourth part of their breadth in thickneſs, and an inch and half long; theſe being thus prepared, you are to engrave on each a mark indicating its purity, or the nature and quantity of the admixture in it.

The black rough marbles, the baſaltes, or the ſofter kinds of black pebbles, are the moſt proper for touch-ſtones.

Now the method of uſing the needles and ſtone is this: the piece of metal to be tried, ought firſt to be wiped well with a clean towel, or piece of ſoft leather, that you may the better ſee its true colour; for from this alone an experienced perſon will, in ſome degree, judge beforehand what the principal metal is, and how and with what debaſed.

Then chuſe a convenient, not over large, part of the ſurface of the metal, and rub it ſeveral times very hardly and ſtrongly againſt the touch-ſtone, that in caſe a deceitful coat or cruſt ſhould have been laid upon it, it may be worn off by that friction: this, however, is more readily done by a grind-ſtone, or ſmall file. Then wipe a flat and very clean part of the touch-ſtone, and rub againſt it, over and over, the juſt mentioned part of the ſurface of the piece of metal, till you have, on the flat ſurface of the ſtone, a thin metallic cruſt, an inch long, and about an eighth of an inch broad: this done, look out the needle that ſeems moſt like to the metal under trial, wipe the lower part of this needle very clean, and then rub it againſt the touch-ſtone, as you did the metal, by the ſide of the other line, and in a direction parallel to it.

When this is done, if you find no difference between the colours of the two marks, made by your needle and the metal under trial, you may with great probability pronounce that metal and your needle to be of the ſame alloy, which is immediately known by the mark engraved

on your needle. But if you find a difference between the colour of the mark given by the metal, and that by the needle you have tried, choose out another needle, either of a darker or lighter colour than the former, as the difference of the tinge on the touch-stone directs; and by one or more trials of this kind you will be able to determine which of your needles the metal answers, and thence what alloy it is of, by the mark of the needle; or else you will find that the alloy is extraordinary, and not to be determined by the comparison of your needles.

TOURINE, a town of the bishopric of Liege, thirteen miles north-east of Namur.

TOURNEY, a city of Flanders, in the Austrian Netherlands, situated on the river Scheld, thirteen miles east of Lisle: E. long. 3° 30′, and N. lat. 50° 37′.

TOURNEFORTIA, in botany, a genus of the pentandria monogynia class. The berry has two cells containing two seeds, perforated with two holes at the apex. There are eight species, none of them natives of Britain.

TOURNEQUET, in surgery, an instrument made of rollers, compresses, screws, *&c.* for compressing any wounded part, so as to stop hæmorrhages. See SURGERY.

TOWER, a tall building, consisting of several stories, usually of a round form, though sometimes square or polygonal.

Towers are built for fortresses, prisons, *&c.* as the Tower of London, the Tower of the Bastile, *&c.*

TOWN, a place inhabited by a considerable number of people, being of a middle size between a city and village.

TOXICODENDRON, in botany. See RHUS.

TOZZIA, in botany, a genus of the didynamia angiospermia class. The calix has five teeth; and the capsule is round, with one cell, containing a single seed. There is but one species, a native of Switzerland.

TRACHEA, in anatomy. See ANATOMY, p. 300.

TRACHELIUM, in botany, a genus of the pentandria monogynia class. The corolla is funnel-shaped; the stigma is globular; and the capsule has three cells. There is but one species, a native of Italy.

TRACHINUS, in ichthyology, a genus belonging to the order of Jugularis. The head is small, smooth, and compressed; there are six rays in the membrane of the gills; the plates of the opercula are serrated; and the anus is near the breast. There is but one species, *viz.* the draco, a native of the northern ocean.

TRACT, in geography, an extent of ground, or a portion of the earth's surface.

TRACT, in matters of literature, denotes a small treatise, or written discourse upon any subject.

TRADE. See COMMERCE.

TRADE-WINDS. See PNEUMATICS, p. 495.

TRADESCANTIA, in botany, a genus of the hexandria monogynia class. The calix consists of three leaves, and the corolla of thre petals; the filaments are villous; and the capsule has three cells. There are three species, all natives of warm countries.

TRADITION, among ecclesiastical writers, denotes certain regulations regarding the rites, ceremonies, *&c.* of religion, which we suppose to have been handed down from the days of the apostles to the present time.

TRADITION, in Scots law. See LAW, Tit viii. 10.

TRAFFIC. See COMMERCE.

TRAGACANTH, in botany. See ASTRAGALUS.

Gum-tragacanth is the produce of this shrub, which grows to about four feet high, and has a firm and robust stem, with numerous branches. The gum is brought to us in long and slender pieces, of a flatted figure, more or or less; and these not strait, or rarely so; but commonly twisted and contorted various ways, so as to resemble worms.

Tragacanth has the same virtues with gum-arabic, but in a greater degree. It greatly inspissates and obtunds the acrimony of the humours, and is therefore found of vast service in inveterate coughs, and other disorders of the breast.

TRAGEDY, a dramatic poem, representing some signal action performed by illustrious persons, and which has frequently a fatal issue, or end. See COMPOSITION.

TRAGI-COMEDY, a dramatic piece partaking of the nature both of tragedy and comedy; the event whereof is not bloody or unhappy, and wherein is admitted a mixture of less serious characters.

TRAGIA, in botany, a genus of the monœcia tetrandria class. The calix of the male consists of three segments, that of the female of five; neither of them have any corolla; the stylus is trifid; and the capsule has three cells, with solitary seeds. There are five species, none of them natives of Britain.

TRAGOPOGON, in botany, a genus of the syngenesia polygamia æqualis class. The receptacle is naked; the calix is simple, and consists of many leaves; and the pappus is feathered. There are eleven species, two of them natives of Britain, *viz.* the pratense, or yellow goat's-beard; and the porrifolium, or purple goat's-beard.

TRAGUS, in anatomy. See ANATOMY, p. 295.

TRAJAN COLUMN, a famous historical column erected in Rome, in honour of the emperor Trajan. It is of the Tuscan order, though something irregular; its height is eight diameters, and its pedestial Corinthian: it was built in a large square there, called Forum Romanum. Its base consists of twelve stones, of an enormous size, and it is raised on a socle, or foot of eight steps; within side is a stair-case, illuminated with forty four windows. It is 140 feet high, which is thirty-five short of the Antonine column, but the workmanship of the former is much more valued. It is adorned from top to bottom with basso relievo's, representing the great actions of that emperor against the Dacæ.

TRAJECTORY *of a comet*, is its path or orbit, or the line it describes in its motion. See ASTRONOMY, p. 444.

TRAIN, a line of gun-powder, said to give fire to a quantity thereof, in order to do execution by blowing up earth-works, buildings, *&c.*

TRAIN OF ARTILLERY, includes the great guns, and other pieces of ordnance belonging to an army in the field.

TRAIN-OIL, the oil procured from the blubber of a whale by boiling.

TRAINING, or TRACING, in mineralogy, a term used by the miners, to express the tracing up the mineral appearances on the surface of the earth to their head, or original place, and there finding a mine of the metal they contain. See MINE.

TRALOS MONTES, a province of Portugal, bounded by Spain on the north-east; by the province of Beira on the south; and by Entreminho Douro on the west.

TRANSACTION, an accommodation of some business,

or dispute between two parties, by a mutual and voluntary agreement between them.

TRANSCENDENTAL, or TRANSCENDANT, something elevated, or raised above other things; which passes and transcends the nature of other inferior things.

TRANSCRIPT, a copy of any original writing, particularly that of an act, or instrument, inserted in the body of another.

TRANSFER, in commerce, *&c.* an act whereby a person surrenders his right, interest, or property in any thing moveable or immoveable to another.

TRANSFORMATION, in general, denotes a change of form, or the assuming a new form different from a former one. The chemists have been for a long time seeking the transformation of metals; that is, their transmutation, or the manner of changing them into gold.

TRANSFERENCE, in Scots law. See LAW, Tit. xxx. 25.

TRANSFUSION, the act of pouring a liquor out of one vessel into another.

TRANSGRESSION, an offence against some law, or a breach or violation thereof.

TRANSILVANIA, a principality bounded by the Carpathian mountains, which divide it from Poland on the north; by Moldavia on the east; by Walachia, and part of Hungary, on the south; and by another part of Hungary on the north; being about 120 miles long, and almost as many broad; and lying between 22 and 25 degrees east long. and between 45 and 48 of north lat.

TRANSIT, in astronomy, signifies the passage of any planet, just by, or over a fixed star, or the sun, and of the moon in particular, covering or moving over any planet. See ASTRONOMY, p. 438.

TRANSITIVE, in grammar, an epithet applied to such verbs as signify an action which passes from the subject that does it, to or upon another subject which receives it. Under the head of verbs transitive, come what we usually call verbs active and passive; other verbs, whose action does not pass out of themselves, are called neuters.

TRANSLATION, the act of transferring or removing a thing from one place to another; we say the translation of a bishop's see, a council, a seat of justice, *&c.*

TRANSLATION is also used for the version of a book or writing out of one language into another.

TRANSMARINE, something that comes from, or belongs to, the parts beyond sea.

TRANSMIGRATION, the removal or translation of a whole people into another country, by the power of a conqueror.

TRANSMIGRATION, is particularly used for the passage of a soul out of one body into another, being the same with what we otherwise call metemphsychosis. See METEMPHSYCHOSIS.

TRANSMUTATION, the act of transforming or changing one nature into another.

TRANSMUTATION, in alchemy, denotes the art of changing or exalting imperfect metals into gold or silver. This is also called the grand operation, and, they say, is to be effected with the philosopher's stone.

TRANSOM, among builders, denotes the piece that is framed across a double light window.

TRANSOM, in a ship, a piece of timber which lies athwart the stern, between the two fashion-pieces, directly under the gun-room port. See SHIP-BUILDING.

TRANSPARENCY, in physics, a quality in certain bodies, whereby they give passage to the rays of light; in contradistinction to opacity, or that quality of bodies which renders them impervious to the rays of light.

TRANSPIRATION, the insensible, or almost insensible, passage of an excrementitious matter through the pores of the skin, called also perspiration.

TRANSPLANTATION, in agriculture and gardening, the act of removing trees or plants from the places where they were sowed, or raised, and planting them in others.

TRANSPORTATION, the act of conveying or carrying a thing from one place to another.

TRANSPOSITION, in grammar, a disturbing or dislocating of the words in a discourse, or a changing of their natural order of construction, to please the ear by rendering the contexture more easy, smooth, and harmonious.

TRANSPOSITION, in musick See MUSICK.

TRANSUBSTANTIATION, in theology, the conversion or change of the substance of the bread and wine in the eucharist, into the body and blood of Jesus Christ, which the Romish church hold is wrought by the consecration of the priest

Action of TRANSUMPT, in Scots law. See LAW, Tit. xxx. 27.

TRANSVERSALIS, in anatomy. See ANATOMY, p. 193.

TRANSVERSE, something that goes across another, from corner to corner: thus bends and bars, in heraldry, are tranverse pieces or bearings: the diagonals of a parallelogram or a square, are transverse lines.

TRAPA, in botany, a genus of the tetrandria monogynia class. The corolla consists of four petals; and the calix of four segments; and the nut has four spines opposite to one another. There is but one species, a native of Asia.

TRAPEZIUM, in geometry, a plane figure contained under four unequal right lines.

TRAPEZIUS, in anatomy. See ANATOMY, p. 193.

TRAVERSE, or TRANSVERSE, in general, denotes something that goes athwart another; that is, crosses and cuts it obliquely.

TRAVERSE, in navigation, is a compound course, wherein several different successive courses and distances are known. See NAVIGATION.

TRAVESTY, a French term, derived from the verb *travestir*, to disguise one's self, or to appear in masquerade: and hence, travesty is applied to the disfiguring of an author, or the translating him into a style and manner different from his own, by which means it becomes difficult to know him.

TREACLE. See THERIACA.

Some also give the name treacle to melasses.

TREASON, in general, signifies betraying; but is more particularly used for the act or crime of infidelity to one's lawful sovereign. See LAW, Tit. xxxiii. 9.

TREASURE, in general, denotes a store or stock of money in reserve.

TREASURER, an officer to whom the treasure of a prince or corporation is committed, to be kept, and duly disposed of.

The lord high treasurer of Great Britain, or first commissioner of the treasury, when in commission, has under his charge and government all the kings revenue, which is kept in the exchequer. He holds his place during the king's pleasure, being instituted by the delivery of a white staff

staff to him: he has the check of all the officers employed in collecting the customs and other royal revenues; and in his gift and disposition are all the officers of the customs in the several ports of the kingdom; escheators in every county are nominated by him; he also makes leases of the lands belonging to the crown.

TREASURY, the place wherein the revenues of a prince are received, preserved, and disbursed.

Lords of the TREASURY. In lieu of one single director and administrator of his majesty's revenues under the title of lord high treasurer, it is at present thought proper to put that office in commission, *i. e.* to appoint several persons to discharge it with equal authority, under the title of lords commissioners of the treasury.

TREATISE, a set discourse in writing on any subject. A treatise is supposed more express, formal, and methodical than an essay, but less so than a system.

TREATY, a covenant between two or more nations; or the several articles or conditions stipulated and agreed upon between sovereign powers.

TREBLE, in musick, the highest or acutest of the four parts in symphony, or that which is heard the clearest and shrillest in a concert.

TREE, the first and largest of the vegetable kind, consisting of a single trunk, out of which spring forth branches and leaves.

TREFOIL. See TRIFOLIUM.

Marsh-TREFOIL, in botany. See MENYANTHES.

Shrub-TREFOIL, in botany. See CYTISUS.

TREMELLA, LAVER, in botany, a genus of sea-plants, of a middle nature, between the alga and conferva, being of a pellucid and membranaceous, and frequently of a gelatinous structure. There are nine species, six of them natives of Britain.

TREMOR, an involuntary shaking, chiefly of the hands and head, sometimes of the feet, and sometimes of the tongue and heart.

TRENCHES, in fortification, are ditches cut by the besiegers, that they may approach more securely to the place attacked; whence they are also called lines of approach.

TRENT BISHOPRICK, a province of Germany, in the circle of Austria, situated on the Alps, which divides Italy from Germany, and sometimes reckoned part of Italy; it is bounded by Tyrol on the north, by the territory of Venice on the east and south, and by the country of the Grisons on the west, being seventy miles long and fifty broad, subject to the house of Austria.

TRENT is also the name of one of the largest rivers in Great Britain, rising in the moor-lands of Staffordshire, and running south-east by Newcastle Under Line, divides that country almost into two equal parts; then entering Derbyshire, turns about to the north-east; and having run the whole length of Nottinghamshire, continues its course due north; at last joining the river Ouse, and several others, it changes its name to that of Humber, and falls into the German sea below Hull.

TREPAN. See SURGERY, p. 664.

TREPANNING, in surgery. See SURGERY, *ibid.*

TRESPASS, in law, signifies any transgression of the law, under treason, felony, or misprision of either; but it is most commonly used for any wrong or damage that is done by one private person to another, or to the king in his forest, *&c.*

TRESSURE, in heraldry, a diminutive of an orle, usually held to be half the breadth thereof. See it represented in Plate CXLVII. fig. 20.

TRET, in commerce, an allowance made for the waste, or the dirt, that may be mixed with any commodity, which is always four pounds in every one hundred and four pounds weight

TRIAL, in law, the examination of a cause, civil or criminal, according to the laws of the land, before a proper judge: or, it is the manner and order observed in the hearing and determining of causes.

TRIANDRIA, in botany. See BOTANY, p. 635

TRIANGLE, in geometry, a figure of three sides and three angles. See GEOMETRY, p. 686.

TRIANGULARIS, in anatomy. See ANATOMY, p. 306.

TRIBE, in antiquity, a certain quantity or number of persons, when a division is made of a city or people into quarters or districts.

TRIBRACHYS, in ancient poetry, a foot consisting of three syllables, and those all short; as *melius*.

TRIBULUS, in botany, a genus of the decandria monogynia class. The calix consists of five segments, and the corolla of five open petals; it has no stylus; and there are five gibbous, bristly capsules, containing many seeds. There are four species, none of them natives of Britain.

TRIBUNAL, in general, denotes the seat of a judge, called in our courts *bench*.

TRIBUNE, among the ancient Romans, a magistrate chosen out of the commons, to protect them against the oppressions of the great, and to defend the liberty of the people against the attempts of the senate and consuls.

The tribunes of the people were first established in the year of Rome 259. The first design of the creation was to shelter the people from the cruelty of usurers, and to engage them to quit the Aventine mount, whither they had retired in displeasure.

Their number, at first, was but two; but the next year, under the consulate of A. Posthumius Aruncius and Cassius Viscellinus, there were three more added; and this number of five was afterwards increased by L. Trebonius to ten. The appellation *tribune* was given them, by reason they were at first chosen out of the tribunes of the army.

Military TRIBUNE, an officer in the Roman army, who commanded in chief over a body of forces, particularly the division of a legion, much the same with our colonel, or the French mestre de camp.

TRIBUTARY, one who pays tribute to another, in order to live in peace with him, or share in his protection.

TRIBUTE, a tax or impost which one prince or state is obliged to pay to another as a token of dependence, or in virtue of a treaty, and as a purchase of peace

TRICEPS, in anatomy. See ANATOMY, p. 205.

TRICHOSTEMA, in botany, a genus of the didynamia gymnospermia class. The upper lip of the corolla is falcated; and the stamina are very long. There are two species, both natives of America.

TRICUSPIDES VALVE, in anatomy. See ANATOMY, p. 279.

TRIDENT, an attribute of Neptune, being a kind of ſceptre which the painters and poets put into the hands of that god, in form of a ſpear, or fork, with three teeth; whence the word.

TRIEMIMERIS, a kind of cæſura in Latin verſe, wherein after the firſt foot of the verſe there remains an odd ſyllable, which helps to make up the next foot.

TRIENNIAL, an epithet applied chiefly to offices or employments which laſt for threee years.

TRIENS, in antiquity, a copper money of the value of one third of an as, which on one ſide bore a Janus's head, and on the other a water-rat.

TRIENTALIS, in botany, a genus of the heptandria monogynia claſs. The calix conſiſts of ſeven leaves, and the corolla of ſeven equal plane ſegments; and the berry is dryiſh. There are two ſpecies, none of them natives of Britain.

TRIERS, or TREVES, the capital of the electorate of Triers in Germany, ſituated on the river Moſelle, ſixty miles ſouth of Cologne: E. long. 6° 10′, N. lat. 49° 55′.

TRIESTE, a port-town of Iſtria, ſituated on the gulph of Venice, ſixty miles north-eaſt of that city.

TRIFOLIUM, in botany, a genus of the diadelphia decandria claſs. The flowers are ſubcapitated; the pod is hardly longer than the calix, and deciduous. There are 43 ſpecies, 16 of them natives of Britain.

TRIGA, in antiquity, denotes a kind of carr, or chariot, drawn by three horſes; whence the name.

TRIGLA, in ichthyology, a genus of fiſhes, belonging to the order of thoracicæ. The head is loricated with rough lines, and there are ſeven rays in the membrane of the gills; There are nine ſpecies.

TRIGLOCHIN, in botany, a genus of the hexandria trigynia claſs. The calix conſiſts of three leaves, and the corolla of three petals; and it has no ſtylus. There are two ſpecies, both natives of Britain, *viz.* the paluſtre, or arrow-headed graſs; and the maritimum, or ſea ſpiked graſs.

TRIGLYPHS, in architecture, a ſort of ornaments repeated at equal intervals in the Doric freeze.

TRIGONELLA, in botany, a genus of the diadelphia decandria claſs. The vexillum and alæ are nearly equal, open, and in the form of a corolla, with three petals. There are 10 ſpecies, none of them natives of Britain.

TRIGONOMETRY.

TRIGONOMETRY is that part of geometry which teaches how to meaſure the ſides and angles of triangles.

Trigonometry is either plane or ſpherical, according as the triangles are PLANE or SPHERICAL; of each whereof we ſhall treat in order.

PLANE TRIGONOMETRY.

PLANE Trigonometry, or that which teaches the menſuration of plane triangles, is commonly divided into *rectangular* and *oblique-angular*.

Of RECTANGULAR PLANE TRIGONOMETRY.

IF in any right-angled triangle, ABC, (Plate CLIX. fig. 1. n° 1.) the hypothenuſe be made the radius, and with that a circle be deſcribed on the one end, A, as a centre; then, it is plain, that BC will be the ſine of the angle BAC; and if with the ſame diſtance, and on the end B as a centre, a circle be deſcribed, it is plain, that AC will be the ſine of the angle ABC; therefore, in general, if the hypothenuſe of a right-angled triangle be made the radius, the two legs will be the ſines of their oppoſite angles.

Again, if in a right-angled triangle DEF (*ibid.* n° 2.) one of the legs, as DF, be made the radius, and on the extremity D (at one of the oblique angles, *viz.* that which is formed by the hypothenuſe and the leg made radius) as a centre, a circle be deſcribed; it is plain, that the other leg, EF, will be the tangent of the angle at D, and the hypothenuſe DE will be the ſecant of the ſame angle. The ſame way, making the leg EF the radius, and on the center E deſcribing a circle, the other leg DF will become the tangent of the angle at E, and the hypothenuſe DE the ſecant of the ſame.

The chord, ſine, tangent, *&c.* of any arch, or angle, in one circle, is proportionable to the chord, ſine, tangent, *&c.* of the ſame arch in any other circle: from which, and what has been ſaid above, the ſolutions of the ſeveral caſes of rectangular trigonometry naturally follow.

Since trigonometry conſiſts in determining angles and ſides from others given, there ariſe various caſes; which being ſeven in rectangular-trigonometry, are as follow.

CASE I. The angles, and one of the legs, of a right-angled triangle being given, to find the other leg.

EXAMPLE. In the triangle ABC (*ibid.* n° 3.) right-angled at B, ſuppoſe the leg AB=86 equal parts, as feet, yards, miles, *&c.* and the angle A=33° 40′; required the other leg BC, in the ſame parts with AB.

I. *Geometrically:* Draw AB=86, from any line of equal parts; upon the point B, erect the perpendicular BC; and, laſtly, from the point A, draw the line AC, making with AB an angle of 33° 40′; and that line produced will meet BC in C, and ſo conſtitute the triangle. The length of BC may be found by taking it in your compaſſes, and applying it to the ſame line of equal parts that AB was taken from.

II. *By calculation:* Firſt, by making the hypothenuſe AC radius, the other two legs will be the ſines of their oppoſite angles, *viz.* AB the ſine of C, and CB the ſine of A. Now ſince the ſine, tangent, *&c.* of any arch in one circle is proportionable to the ſine, tangent, *&c.* of the ſame arch in any other circle, it is plain the ſines of the angles A and C in the circle deſcribed by the radius AC, muſt be proportional to the ſine of the ſame arches or angles, in the circle, that the table of artificial ſines, *&c.* was calculated for; ſo the proportion for finding BC will be

$$S, C : AB :: S, A : BC$$

i. e. as the ſine of the angle C in the tables, is to the length of AB (or ſine of C in the circle whoſe radius is AC) ſo is the ſine of the angle A in the tables, to the length of BC

B C (or ſine of the ſame angle in the circle whoſe radius is A C.) Now the angle A being 33° 40′, the angle C muſt be 56° 20′; therefore looking in the table of artificial ſines, &c. for the ſines of the two angles, and in the table of logarithms for the logarithm of 86 the given leg, we ſhall find, by proceeding according to the foregoing proportion, that the required leg BC is 57.28; and the operation will ſtand as follows:

1.93450	AB	86
9.74380	S, A	33° 40′
11.67830		
9.92027	S, C	56° 20′
1.75803	BC	57.28

Secondly, making A B the radius, it is plain BC, the leg required, will be the tangent of the given angle A; and ſo the proportion for finding B C, when A B is made the radius, will be:

R : T, A :: A B : B C

i. e. as the radius in the tables, is to the tangent of the angle A in the ſame; ſo the length of B A, or radius in the ſcheme, to the length of B C or tangent of A in the ſcheme: therefore looking in the tables for the parts given in the foregoing proportion, and proceeding with them according to that rule, we ſhall find B C to be 57.28 as before, and the operation will be as follows:

9.82352	T, A	33° 40′
1.93450	A B	86
11.75802		
10.00000	Rad.	90°
175802	B C	57.28

Laſtly, by making BC, the leg required, the radius, it is plain that AB will be the tangent of C, and the proportion for finding BC will be as follows:

T, C : R :: A B : B C

i. e. as the tangent of C	56°, 20′	10.17648
is to radius	90°	10.00000
ſo is the length of AB	86	1.93450
		11.93450
		10.17648
to the length of BC	57.28	1.75802

Case II. The angles and one of the legs given, to find the hypothenuſe.

Example: In the triangle ABC, (*ibid.* n° 4.) ſuppoſe AB 124, and the angle A 34° 20′; conſequently the angle C 55° 40′, required the hypothenuſe A C, in the ſame parts with A B.

I. *Geometrically:* This caſe is conſtructed after the ſame manner with the former; and the hypothenuſe, A C, is found, by taking its length in your compaſſes, and applying that to the ſame line of equal parts from which AB was taken.

II. *By caculation:* Firſt, making A C the radius, we ſhall have the following proportion for finding A C, *viz.*

S, C : R :: A B : A C

i. e. as the ſine of C	55° 40′	9.91686
is to radius	90°	10.00000
ſo is AB	124	2.09342
to AC	150.2	2.17656

Secondly, making A B the radius, we have this proportion, *viz.*

R : ſec. A :: A B : A C.

i. e. as the radius	90°	0.00000
to the ſecant of A	34° 20′	10.08314
ſo is A B	124	2.09342
to A C	150.2	2.17656

This may alſo be done, without the help of the ſecants: for ſince R : ſec. :: Co-S. : R; therefore, the former proportion will become,

Co-S, A : R :: A B : A C.

i. e. as the co-ſine of A	34°, 20′	9.91686
is to the radius	90°	10.00000
ſo is A B	124	2.09342
to A C	150.2	2.17656

Thirdly, making B C the radius, we have the following proportion, *viz.*

T, C : ſec. C :: A B : A C.

i. e. as the tangent of C	55°, 40′	10.16558
is to ſec. C	55°, 40′	10.24872
ſo is AB	124	2.09342
to AC	150.2	2.17656

This likewiſe may be done without the help of ſecants; for ſince T, : Sec. :: S, : R; therefore the former analogy will be reduced to this, *viz.*

S, C : R :: A B : A C,

where no ſecants do appear; and it coincides with that in the firſt ſuppoſition of this caſe, ſo we ſhall not repeat the operation.

Case III. The angles and hypothenuſe given, to find either of the legs.

Example. In the triangle ABC, (*ibid.* n° 4.) ſuppoſe the hypothenuſe AC = 146, and the angle A = 36° 25′; conſequently the angle C = 53° 35′; required the leg A B.

I. *Geometrically:* Draw the line A B at pleaſure, and make the angle B A C equal to 36° 25′; then take A C equal to 146 from any line of equal parts; laſtly, from the point C, let fall the perpendicular C B, on the line A B. So the triangle is conſtructed, and A B may be meaſured from the line of equal parts.

II. *By calculation:* Firſt, making A C the radius, we ſhall have the following proportion, *viz.*

R : S, C :: A C : A B.

i. e. As radius	90°	10.00000
to the ſine of C	53° 35′	9.90565
ſo is A C	146	2.16435
to A B	117.5	2.07000

Secondly, making AB the radius, we have the following analogy, *viz.*

Sec. A : R :: A C : A B.

i. e. As the ſecant of A	36° 25′	10.09435
is to radius	90°	10.00000
ſo is A C	146	2.16435
to A B	117.5	2.07000

This may alſo be done without the help of ſecants; for ſince ſec. : R :: R : Co-S, the former proportion may be reduced to this, *viz.*

R : Co-S, A :: A C : A B,

which is the ſame with the proportion in the firſt ſuppoſition.

Thirdly, by ſuppoſing B C the radius, we have the following proportion, *viz.*

Sec. C : T, C :: A C : A B,

i. e. as the ſecant of C	53°, 35′	10.22647

is to the tangent of C	53°, 35′	10.13212
ſo is AC	146	2.16435
to AB	117.5	2 07000

Case IV. The two legs being given, to find the angles.

Example. In the triangle ABC, (*ibid.* n° 5.) ſuppoſe AB 94 and BC 56, required the angles A and C.

I. *Geometrically:* Draw AB equal to 94, from any line of equal parts; then from the point B raiſe BC perpendicular to AB, and take BC from the former line of equal parts equal to 56; laſtly, join the points A and C with the ſtraight line AC: ſo the triangle is conſtructed, and the angles may be meaſured by a line of chords.

II. *By calculation:* Firſt, ſuppoſing AB the radius, we have this analogy, *viz.*

AB : BC :: R : T, A,

i. e. as AB	94	1.97313
is to BC	56	1.74819
ſo is the radius	90°	10.00000
to the tangent of A	30° 47′	9.77506

Secondly, making BC the radius, we have this proportion, *viz.*

BC : BA :: R : T, C.

i. e. as BC	56	1.74819
is to AB	94	1.97313
ſo is the radius	90°	10.00000
to the tangent of C	59° 13′	10.22494

Case V. The hypothenuſe and one of the legs given, to find the angles.

Example. In the triangle DEF, (*ibid.* n° 6.) ſuppoſe the leg DE=83, and the hypothenuſe DF=126; required the angles D and F.

I. *Geometrically*: Draw the line DE=83 from any line of equal parts; and from the point E raiſe the perpendicular EF: then take the length of DF=126, from the ſame line of equal parts; and ſetting one foot of your compaſſes in D, with the other croſs the perpendicular EF in E: laſtly, join D and F; and the triangle being thus conſtructed, the angles may be meaſured by a line of chords.

II. *By calculation*: Firſt, making DF the radius, we ſhall have this proportion, *viz.*

DF : DE :: R : S, F.

i. e. as DF	126	2.10037
is to DE	83	1.91908
ſo is radius	90°	10.00000
to the ſine of F	41° 12′	9.81871

Secondly, by ſuppoſing DE the radius, we have the following analogy, *viz.*

DE : DF :: R : Sec. D.

i. e. as DE	83	1.91908
is to DF	126	2.10037
ſo is radius	90°	10.00000
to the ſecant of D	48° 48′	10 18129

This may be done without the help of ſecants; for ſince R : ſec. :: Co-S, : R, the foregoing analogy will become this, *viz.*

DF : DE :: R : Co-S, D.

which gives the ſame anſwer with that deduced from the firſt ſuppoſition.

Case VI. The two legs being given, to find the hypothenuſe.

Example: In the triangle ABD, (*ibid.* n° 7.) ſuppoſe the leg AB=64, and BD=56: required the hypothenuſe.

I. *Geometrically:* The conſtruction of this caſe is performed the ſame way as in the fourth caſe, and the length of the hypothenuſe is found by taking it in your compaſſes, and applying it to the ſame line of equal parts that the two legs were taken from.

II. *By calculation*: This caſe being a compound of the fourth and ſecond caſes, we muſt firſt find the angles by the fourth, thus:

AB : DB :: R : T, A.

i. e. as the leg AB	64	1.80618
is to the leg DB	56	1.74819
ſo is the radius	90	10.00000
to the tangent of A	41° 11′	9.94201

Then by the ſecond caſe we find the hypothenuſe required thus:

S, A : R :: BD : AD,

i. e. as the ſine of A	41°, 11′	9.81854
is to the radius	90°	10.00000
ſo is the leg BD	56	1.74819
to the hypoth. AD	85.05	1.92965

This caſe may alſo be ſolved after the following manner, *viz.*

From twice the logarithm of the greater ſide AB	3.61236
ſubtract the logarithm of the leſſer ſide BD	1.74819
and there remains	1.86417
the logarithm of 73.15; to which adding the leſſer ſide BD, we ſhall have 189.15, whoſe logarithm is	2.11093
to which add the logarithm of the leſſer ſide BD	1.74819
and the ſum will be	3.85912
the half of which is	1.92956

the logarithm of the hypothenuſe required.

Or it may be done by adding the ſquare of the two ſides together, and taking the logarithm of that ſum, the half of which is the logarithm of the hypothenuſe required: thus, in the preſent caſe,

the ſquare of AB (64) is	4096
the ſquare of BD (56) is	3136
the ſum of theſe ſquares is	7232
the logarithm of which is	3.85926
the half of which is	1.92962=

to the logarithm of 85.05, the length of the hypothenuſe required.

Case VII. The hypothenuſe and one of the legs being given, to find the other leg.

Example. In the triangle BGD, (*ibid.* n° 8.) ſuppoſe the leg BG=87, and the hypothenuſe BD=142; required the leg DG.

I. *Geometrically*: The conſtruction here is the ſame as in caſe V. the ſame things being given; and the leg DG is found by taking its length in your compaſſes, and applying that to the ſame line of equal parts the others were taken from

II. *By calculation:* The ſolution of this caſe depends upon the 1ſt and 5th; and firſt we muſt find the oblique angles by caſe 5th thus:

DB : BG :: R : S, D.

i. e. as the hypoth. DB	142	2.15229

is

is to the leg BG	87	1.93952
so is radius	90°,	10.00000
to the sine of D	37°, 47′	97.8723

Then by case 1st, we find the leg DG required, thus:

R : S, B :: B D : D G,

i. e. as radius	90°	10.00000
is to the sine of B	52°, 13′	9.89781
so is the hypoth. DB	142	2.15229
to the leg DG	112.2	2,05010

The leg DG may also be found in the following manner, *viz.*

To the log of the sum of the hypothenuse and given leg, *viz.* 229	2.35984
add the logarithm of their difference, *viz.* 55	1.74036
and their sum is	4.10020
the half of that is	2.05010

the log. of 112.2 the leg required.

Or it may be done by taking the square of the given leg from the square of the hypothenuse, and the square root of the remainder is the leg required: thus, in the present case,

The square of the hypothenuse (142) is	20164
The square of the leg BG (87) is	7569
Their difference is	12595
Whose logarithm is	4.10020
The half of which is	2.05010

which answers to the natural number 112.2 the leg required.

Thus have we gone through the seven cases of right-angled plane trigonometry; from which we may observe, 1. That to find a side, when the angles are given, any side may be made the radius. 2. To find an angle, one of the given sides must of necessity be made the radius.

Of Oblique-angled Plane Trigonometry.

In oblique-angled plane trigonometry there are six cases; but before we shew their solution, it will be proper to premise the following theorems.

Theorem I. In any triangle ABC (*ibid.* fig. 2. n° 2.) the sides are proportional to the signs of the opposite angles: thus, in the triangle A B C, A B : B C :: S, C : S, A, and A B : A C :: S, C : S B : also A C : B C :: S, B : S, A.

Demonstration. Let the triangle ABC be inscribed in a circle; then, it is plain (from the property of the circle) that the half of each side is the sine of its opposite angle: but the sines of these angles, in tabular parts, are proportional to the sines of the same in any other measure; therefore, in the triangle ABC, the sines of the angles will be as the halves of their opposite sides; and since the halves are as the wholes, it follows, that the sines of the angles are as their opposite sides; *i. e.* S, C : S, A :: A B : B C, *&c.*

Theor. II In any plane triangle, as ABC (*ibid.* n° 2.) the sum of the sides, AB and BC, is to the difference of these sides, as the tangent of half the sum of the angles BAC, ABC, at the base, is to the tangent of half the difference of these angles.

Demon. Produce AB; and make BH equal to BC; join HC. and from B let fall the perpendicular BE; through B draw BD parallel to AC, and make HF equal to CD, and join BF; also take BI equal to BA, and draw IG parallel to BD or AC.

Then it is plain that AH will be the sum, and HI the difference of the sides AB and BC; and since HB is equal to BC, and BE perpendicular to HC, therefore HE is equal to EC; and BD being parallel to AC and IG, and AB equal to BI, therefore CD or HF is equal to GD, and consequently HG is equal to FD, and half HG is equal to half FD or ED. Again, since HB is equal to BC, and BE perpendicular to HC, therefore the angle EBC is half the angle HBC; but the angle HBC is equal to the sum of the angles A and C, consequently the angle EBC is equal to half the sum of the angles A and C. Also, since HB is equal to BC, and HF equal to CD, and the included angles BHF BCD equal, it follows that the angle HBF is equal to the angle DBC, which is equal to BCA; and since HBD is equal to the angle A, and HBF equal to BCA, therefore FBD is the difference, and EBD half the difference of the two angles A and BCA: so making EB the radius, it is plain EC is the tangent of half the sum, and ED the tangent of half the difference of the two angles at the base. Now IG being parallel to AC, the triangles HIG and HAC will be equiangular; consequently AH : IH :: CH : GH; but the wholes are as their halves, therefore AH : IH :: $\frac{1}{2}$CH : $\frac{1}{2}$GH; and since $\frac{1}{2}$CH is equal to EC, and $\frac{1}{2}$GH equal to $\frac{1}{2}$FD=ED, therefore AH : IH :: EC : ED. Now AH is the sum, and IH the difference of the sides; also EC is the tangent of half the sum, and ED the tangent of half the difference of the two angles at the base; consequently, in any triangle, as the sum of the sides is to their difference, so is the tangent of half the sum of the angles at the base to the tangent of half their difference.

Theorem III. If to half the sum of two quantities be added half their difference, the sum will be the greater of them; and if from half their sum be subtracted half their difference, the remainder will be the least of them. Suppose the greater quantity to be $x=8$, and the lesser $z=6$; then is their sum 14, and difference 2:

wherefore, adding $\frac{14}{2}=7$ to $\frac{2}{2}=1$, we get 8 the greatest of the two quantities: and, in the same manner, $\frac{14}{2}-\frac{2}{2}=7-1=6$, the least of the two quantities.

Theor. IV. In any right-lined triangle, ABD (*ibid.* n° 3.) the base AD is to the sum of the sides AB and BD, as the difference of the sides is to the difference of the segments of the base made by the perpendicular BE, *viz.* the difference between AE ED.

Demon. Produce DB till BG be equal to BA the lesser leg; and on B as a centre, with the distance BA or BG, describe the circle AGHF, which will cut BD and AD in the points H and F: then it is plain GD is the sum, and HD the difference of the sides; also since AD is equal to EF, therefore FD is the difference of the segments of the base; but AD : GD :: HD : FD; therefore the base is to the sum of the sides, *&c.* as was to be proved.

Having established these preliminary theorems, we shall now proceed to the solution of the six cases of oblique-angled plane trigonometry.

Case I. In any oblique-angled plane triangle, two sides and

and an angle oppoſite to one of them being given, to find the angle oppoſite to the other.

Example. In the triangle ABC (*ibid.* n° 4.) ſuppoſe AB=156, BC=34, and the angle C (oppoſite to AB)=56° 30′; required the angle A, oppoſite to BC.

2. *Geometrically:* Draw the line AC, and at any point of it, ſuppoſe C, make the angle C=56° 30′; then take CB=84, and with the length of 156=AB taken in your compaſſes from the ſame ſcale of equal parts, fixing one point in B, with the other croſs AC in A: Laſtly, join A and B; ſo the triangle is conſtructed, and the required angle A may be meaſured by a line of chords.

2. *By calculation:* We have, by theor. 1. the following proportion for finding the angle A, *viz.*

AB : BC :: S, C : S, A.

i. e. as AB	156	2.19312
To BC	84	1.92428
So is S, C	56° 30′	9.92111
To S, A	26° 41′	9.65227

Case II. The angles, and a ſide oppoſite to one of them, being given, to find a ſide oppoſite to another.

Example. In the triangle HBG (*ibid.* n° 5.) ſuppoſe the angle H 46° 15′, and the angle B 54° 22′, conſequently the angle G 79° 23′, and the leg HB 125, required HG.

Geometrically: Draw HB 125, from any line of equal parts, and make the angle H 46° 15′, and B 54° 22′, then produce the lines HG and BG till they meet one another in the point G: ſo the triangle is conſtructed, and HG is meaſured by taking its length in your compaſſes, and applying it to the ſame line of equal parts that HB was taken taken from.

2. *By calculation:* By the firſt of the preceding theorems, we have this analogy for finding HG. *viz.*

S, G : HB :: S, B : HG.

i. e. As the ſine of G	79° 23′	9.99250
is to the leg HB	125	2.09691
ſo is the ſine of B	54° 22′	9.90996
to the leg HG	103.4	2.01437

Case III. Two ſides and an angle oppoſite to one of them given, to find the third ſide.

Example. In the triangle KLM (*ibid.* n° 6.) ſuppoſe the ſide CL 126 equal parts, and KM 130 of theſe parts, and the angle L (oppoſite to KM) 63° 20′, required the ſide ML.

1. *Geometrically:* The conſtruction of this caſe is the ſame with that in Caſe I. (there being the ſame things given in both,) and the leg ML may be meaſured by applying it to the ſame line of equal parts that the other two were taken from.

2. *By calculation:* The ſolution of this caſe depends upon the two preceding ones; and, firſt, we muſt find the other two angles by Caſe I. thus:

MK : S, L :: KL : S, M.

i. e. As the ſide MK	130	2.11394
To the ſine of L	63° 20′	9.95116
So is the ſide KL	126	2.10037
To the ſine of M	60° 1′	9.93759

Then by Caſe II. we have the required leg ML, thus:

S. L : S. K :: MK : ML.

i. e. As the ſine of L	63° 20′	9.95116
To the ſine of K	53° 39′	9.90602
So is KM	130	2.11394
To ML	117.2	2.06850

Case IV. Two ſides and the contained angle being given, to find the other two angles.

Example: In the triangle ACD (*ibid.* n° 7.) ſuppoſe AC=103, AD=126, and the angle A=54° 30′; required the angles C and D.

1. *Geometrically:* Draw AD=126, and make the angle A=54° 30′; then ſet off 103 equal parts from A to C: laſtly, join C and D; and ſo the triangle is conſtructed, and the angles C and D may be meaſured by a line of chords.

2. *By calculation:* The ſolution of this caſe depends upon the ſecond and third of the preceding theorems; and firſt we muſt find the ſum and difference of the ſides, and half the ſum of the unknown angles, thus:

The leg AD is	126
The leg AC is	103
Their ſum is	229
And their difference is	23
The ſum of the three angles A, D, and C, is	180°
The angle A is	54° 30
So the ſum of the angles C and D will be	125° 30′
And half their ſum is	62° 45′

Then by theor. 2. we have the following proportion, *viz.*

As the ſum of the ſides AD and AC=229		2.35984
To their difference	23	1.36173
So is the tangent of half the ſum of the unknown angles C and D	62° 45′	10.28816
To tang. of half their difference	11° 2′	9.29005

Now having half the ſum and half the difference of the two unknown angles C and D, we find the quantity of each of them by theorem 3. thus:

To half the ſum of the angles C and D, *viz.*	62° 45′
Add half their difference, *viz.*	11° 02′
And the ſum is the greater angle C	73° 47′
Again from half their ſum, *viz.*	62° 45′
Take half their difference, *viz.*	11° 02
And there will remain the leſſer angle D	=51° 43′

N B. The greater angle is always that ſubtended by the greater ſide: thus, in the preſent caſe, the greater angle C, is ſubtended by the greater ſide AD; and the leſſer angle D is ſubtended by the leſſer ſide AC.

Case V. Two ſides and the contained angle being given, to find the third ſide.

Example. In the triangle BCD (*ibid.* n° 8.) ſuppoſe BC=154, BD=133, and the angle B=56° 03′; required the ſide CD

1. *Geometrically:* The conſtruction of this caſe is the ſame with that of the laſt, and the length of DC is found by taking its length in your compaſſes, and applying it to the ſame line of equal parts that the two legs were taken from.

2. *By calculation:* The ſolution of this caſe depends upon the ſecond and fourth; and firſt we muſt find the angles by the laſt caſe; thus:

As the ſum of the ſides BD and BC 287	2.45788

Is to their difference 21			1.32222
So is the tangent of half the sum of the angles D and C		61° 58'	10.27372
To the tangent of half their difference		7° 50'	9.13806

So by theorem 3. we have the angles D and C thus:

To half the sum of the angles D and C	61° 58'
Add half their difference	7° 50'
And the sum is the greater angle D	69° 48'
Also, from half the sum	61° 58'
Take half the difference	7° 50'
And there remains the lesser angle C	54° 08'

Then by Case II. we have the following analogy for finding DC the leg required, *viz.*

S. C : B D : : S, B : D C.

i. e. As the sine of C	54° 08′	9.90869
To BD	133	2.12385
So is the sine of B	56° 03′	9 91883
To DC	136.2	2 13399

Case VI. Three sides being given, to find the angles.

Example: In the triangle A B C (*ibid* n° 9.) suppose AB=156, AC=185.7, and BC=84; required the angles A, B, and C.

I. *Geometrically:* Make AC=185.7 from any line of equal parts; and from the same line taking 156=AB in your compasses, fix one foot of them in A, and with another sweep an arch; then take 84=BC in your compasses, and fixing one foot in C, with the other sweep an arch, which will cross the former in B: lastly, join the points B and A, and B and C; so the triangle will be constructed, and the angles may be measured by a line of chords.

II. *By calculation:* Let fall the perpendicular, B D, from the vertex B, upon the base AC; which will divide the base into two segments AD and DC, the lengths whereof may be found by theorem 4. thus:

As the base AC	185 7	2 26893
To the sum of the sides AB and BC	240	2 38031
So is the difference of the sides	72	1.85733
To the diff. of the segments of the base	93	1.96871

And having the sum of the segments *viz.* the whole base, and their difference, we find the segments themselves, by theorem 3. thus:

To half the sum of the segments	92.8
And half their difference	46.5
And the sum is the greater segment AD	139.3
Also from half the sum of the segment	92.8
Take half their difference	46.5
The remainder is the lesser segment DC	46 3

Now the triangle ABC is divided, by the perpendicular DB, into two right-angled triangles, ADB and DBC; in the first of which are given the hypothenuse AB=156, and the base AD=139.3, to find the oblique angles, for which we have (by Case V. of rectangular trigonometry) the following analogy, *viz.*

As AB	156	2.19312
To AD	139 3	2.14395
So is the radius	90°	10 00000
To the co-sine of the angle A	26° 40'	9.95083

Also the angle C is found by the same case, thus:

As BC	84	1.92428
To CD	46.3	1 66558
So is the radius	90°	10 00000
To the co-sine of C	56° 30'	9 74130

Having found the two angles A and C, we have the third, B, by taking the sum of the other two from 180, thus:

The sum of all the three angles is 180°	
The sum of A and C is	83° 10'
The angle B is	96° 50'

All the proportions used for the solutions of the several cases in plain trigonometry, may be performed by the scale and compass. On the scale there are several logarithmic lines, *viz.* one of numbers, another of sines, and one of tangents, *&c.*

And the way of working a proportion by these is this, *viz.* extend your compasses from the first term of your proportion, found on the scale, to the second; and with that extent, fixing one foot in the third term, the other will reach the fourth term required.

SPHERICAL TRIGONOMETRY.

Spherical Trigonometry is the art whereby, from three given parts of a spherical triangle, we discover the rest; and, like plane trigonometry, is either right-angled, or oblique-angled. But before we give the analogies for the solution of the several cases in either, it will be proper to premise the following theorems.

Theorem I. In all right-angled spherical triangles, the sine of the hypothenuse: radius : : sine of a leg : sine of its opposite angle. And the sine of a leg : radius : : tangent of the other leg : tangent of its opposite angle.

Demonstration. Let E D A F G (*ibid.* fig. 3.) represent the eighth part of a sphere, where the quadrantal planes EDFG, EDBC, are both perpendicular to the quadrantal plane ADFB; and the quadrantal plane ADGC is perpendicular to the plane EDFG; and the spherical triangle ABC is right-angled at B, where CA is the hypothenuse, and BA, BC, are the legs.

To the arches G F, C B, draw the tangents H F, OB, and the sines GM CI on the radii DF DB; also draw BL the sine of the arch AB, and CK the sine of AC; and then join IK and OL Now HF, OB, GM, CI, are all perpendicular to the plane ADFB. And HD, GK, OL, lie all in the same plane ADGC. Also FD, IK, BL, lie all in the same plane ADGC. Therefore, the right-angled triangles HFD, CIK, ODL, having the equal angles HDF, CKI, OLB, are similar. And CK : DG : : CI : GM; that is, as the sine of the hypothenuse : rad. : : sine of a leg : sine of its opposite angle. For GM is the sine of the arc GF, which measures the angle CAB. Also, LB : DF : : BO : FH; that is, as the sine of a leg : radius : : tangent of the other leg : tangent of its opposite angle, Q. E. D.

Hence it follows, that the sines of the angles of any oblique spherical triangle ACD (*ibid.* n° 2.) are to one another, directly, as the sines of the opposite sides. Hence it also follows, that, in right-angled spherical triangles, having the same perpendicular, the sines of the bases will be to each other, inversely, as the tangents of the angles at the bases.

Theorem

THEOREM II. In any right-angled ſpherical triangle ABC (*ibid.* n° 3.) it will be, As radius is to the co ſine of one leg, ſo is the co ſine of the other leg to the co-ſine of the hypothenuſe.

Hence, if two right-angled ſpherical triangles ABC, CBD (*ibid.* n° 2) have the ſame perpendicular BC, the co-ſines of their hypothenuſes will be to each other, directly, as the co ſines of their baſes.

THEOREM III. In ony ſpherical triangle it will be, As radius is to the ſine of either angle, ſo is the co-ſine of the adjacent leg to the co-ſine of the oppoſite angle.

Hence, in right-angled ſpherical triangles, having the ſame perpendicular, the co-ſines of the angles at the baſe will be to each other, directly, as the ſines of the vertical angles.

THEOREM IV. In any right-angled ſpherical triangle it will be, As radius is to the co-ſine of the hypothenuſe ſo is the tangent of either angle to the co-tangent of the other angle.

As the ſum of the ſines of two unequal arches is to their difference, ſo is the tangent of half the ſum of thoſe arches to the tangent of half their difference: and, as the ſum of the co ſines is to their difference, ſo is the co-tangent of half the ſum of the arches to the tangent of half the difference of the ſame arches.

THEOREM V. In any ſpherical triangle ABC (*ibid.* n° 4 and 5.) It will be, as the co-tangent of half the ſum of half their difference, ſo is the co-tangent of half the baſe to the tangent of the diſtance (DE) of the perpendicular from the middle of the baſe.

Since the laſt proportion, by permutation, becomes co-tang. $\frac{AC+BC}{2}$: co-tang. AE : : tang. $\frac{AC-BC}{2}$: tang. DE, and as the tangents of any two arches are, inverſely, as their co-tangents; it follows, therefore, that tang. AE : tang. $\frac{AC+BC}{2}$: : tang. $\frac{AC-BC}{2}$: tang. DE; or, that the tangent of half the baſe is to the tangent of half the ſum of the ſides, as the tangent of half the difference of the ſides to the tangent of the diſtance of the perpendicular from the middle of the baſe.

THEOREM VI. In any ſpherical triangle ABC (*ibid.* n° 4) it will be, as the co tangent of half the ſum of the angles at the baſe, is to the tangent of half their difference, ſo is the tangent of half the vertical angle to the tangent of the angle which the perpendicular CD makes with the line CF biſecting the vertical angle.

The Solution of the Caſes of right-angled ſpherical Triangles, (*ibid.* n° 3.)

Caſe	Given	Sought	Solution
1	The hyp. AC and one angle A	The oppoſite leg BC	As radius : ſine hyp. AC :: ſine A : ſine BC (by the former part of theor. 1.)
2	The hyp AC and one angle A	The adjacent leg AB	As radius : co-ſine of A : : tang. AC. tang. AB by the latter part of theo. 1.
3	The hyp. AC and one angle A	The other angle C	As radius : co-ſine of AC :: tang. A : co-tang. C (by theorem 4.)
4	The hyp AC and one leg AB	The other leg BC	As co ſine AB : radius :: co-ſine AC : co-ſine BC (by theorem 2.)
5	The hyp AC and one leg AB	The oppoſite angle C	As ſine AC : radius :: ſine AB : ſine C (by the former part of theorem 1.)
6	The hyp. AC and one leg AB	The adjacent angle A	As tang. AC : tang. AB :: radius : co-ſine A (by theorem 1.)
7	One leg AB and the adjacent angle A	The other leg BC	As radius : ſine AB :: tangent A : tangent BC (by theorem 4.)
8	One leg AB and the adjacent angle A	The oppoſite angle C	As radius : ſine A :: co-ſine of AB : co-ſine of C (by theorem 3.)
9	One leg AB and the adjacent angle A	The hyp. AC	As co ſine of A : radius :: tang. AB : tang. AC (by theorem 1.)
10	One leg BC and the oppoſite angle A	The other leg AB	As tang. A : tang. BC :: radius : ſine AB (by theorem 4.)
11	One leg BC and the oppoſite angle A	The adjacent angle C	As co-ſine BC : radius :: co-ſine of A : ſin. C (by theorem 3)
12	One leg BC and the oppoſite angle A	The hyp. AC	As ſin. A : ſin. BC :: radius : ſin. AC (by theorenm 1.)
13	Both legs AB and BC	The hyp. AC	As radius : co-ſine AB :: co-ſine BC : co ſine AC (by theorem 2.)
14	Both legs AB and BC	An angle, ſuppoſe A	As ſine AB : radius :: tang. BC : tang. A (by theorem 4.)
15	Both angles A and C	A leg, ſuppoſe AB	As ſine A : co-ſine C :: radius : co-ſine AB (by theorem 3.)
16	Both angles A and C	The hyp. AC	As tan. A : co-tang. C :: radius : co-ſine AC (by theorem 4.)

Note, The 10th, 11th, and 12th caſes are ambiguous; ſince it cannot be determined by the data, whether A, B, C, and AC, be greater or leſs than 90 degrees each.

The

The Solution of the Cases of oblique spherical Triangles, (*ibid.* n° 4. and 5.)

Case	Given	Sought	Solution
1	Two sides AC, BC, and an angle A opposite to one of them.	The angle B opposite to the other	As sine BC : sine A :: sine AC : sine B (by theor. 1.) Note, this case is ambiguous when BC is less than AC; since it cannot be determined from the data whether B be acute or obtuse.
2	Two sides AC, BC, and an angle A opposite to one of them.	The included angle ACB	Upon AB produced (if need be) let fall the perpendicular CD : then (by theor. 4.) rad. : co-sine AC :: tang. A : co-tang. ACD, but (by theor. 1.) as tang. BC : tang. AC :: co-sine ACD : co-sine BCD. Whence ACB=ACD± BCD is known.
3	Two sides AC, BC, and an angle opposite to one of them	The other side AB	As rad. : co-sine A :: tang. AC : tang. AD (by theor. 1.) and (by theor. 2.) as co-sine AC : co-sine BC :: co-sine AD : co-sine BD. Note, this and the last case are both ambiguous when the first is so.
4	Two sides AC, AB, and the included angle A	The other side BC	As rad. : co-sine A :: tang. AC : tan. AB (by theor. 1.) whence AD is also known : then (by theor. 2.) as co-sine AD : co-sine BD :: co-sine AC : co-sine BC.
5	Two sides AC, AB, and the included angle A	Either of the other angles, suppose B	As rad. : co-sine A :: tang. AC : tan. AD (by theorem 1.) whence BD is known : then (by theor. 4.) is sine BD: sine AD :: tan. A : tan. B.
6	Two angles A, ACB, and the side AC betwixt them	The other angle B	As rad. : co-sine AB :: tang. A : co-tang. ACD (by theor. 4.) whence BCD is also known : then (by theor. 3.) as sine ACD : sine BCD :: co-sine A : co-sine B.
7	Two angles A, ACB, and the side AC betwixt them	Either of the other sides suppose BC	As rad. : co-sine AC :: tang. A : co-tang. ACD (by theo. 4) whence BCD is also known : then, as co-sine BCD: co-sine ACD :: tang. AC : tang. BC (by theor. 1.)
8	Two angles A,B, and a side AC opposite to one of them	The side BC opposite the other	As sine B : sine AC :: sine A : sine BC (by theorem 1.)
9	Two angles A,B, and a side AC opposite to one of them	The side AB betwixt them	As rad. : co-sine A :: tang. AC : tan. AD (by theor. 1) and as : tang. B : tang. A :: sine AD : sine BD (by theor. 4.) whence AB is also known.
10	Two angles A,B, and a side AC opposite to one of them	The other angle ACB	As rad : co-sine AC :: tang. A : co-tang. ACD (by theor. 4.) and as co-sine A : co-sine B :: sine ACD : sine BCD (by theor. 3.) whence ACB is also known.

Case	Given	Sought	Solution
11	All the three sides AB, AC, and BC	An angle, suppose A	As tang. $\frac{1}{2}$ AB : tang. $\frac{AC+BC}{2}$: : tang. $\frac{AC-BC}{2}$: tang. DE, the distance of the perpendicular from the middle of the base (by theor. 6.) whence AD is known : then, as tang. AC : tang. AD : : rad. : co-sine A (by theorem 1.)
12	All the three angles A,B, and ACB	A side, suppose AC	As co-tan. $\frac{ABC+A}{2}$: tan. $\frac{ABC-A}{2}$: : tang. $\frac{ACB}{2}$: tang. of the angle included by the perpendicular and a line bisecting the vertical angles ; whence ACD is also known : then (by theor. 5.) tang. A : co-tang. ACD : : rad. : co-sine AC.

TRINGA, in ornithology, a genus of birds belonging to the order of grallæ. The beak is somewhat cylindrical, and as long as the head; the nostrils are linear; and there are four toes on the feet, the hind one consisting of one joint, and elevated above the ground. There are 23 species, principally distinguished by their colour.

TRINGLE, in architecture, a name common to several little square members or ornaments, as reglets, listels, and plat-bands. It is more particularly used for a little member fixed exactly over every triglyph, under the plat-band of the architrave, from whence the guttæ or pendant drops hang down.

TRINIDAD, or Trinity-island, is situated in the Atlantic or American ocean, between 60° and 62° of west longitude, and between 9° and 11° of north latitude; it is about ninety miles long, and sixty broad.

TRINIDAD, a port-town of Mexico, in America, situated in the province of Guatimala, an hundred and twenty miles south-east of the city of Guatimala: W. long. 94°, N. lat. 13°.

TRINITARIANS, those who believe in the Trinity; those who do not believe therein, being called antitrinitarians.

Trinitarians also denote an order of religious instituted at Rome in the year 1198, under the pontificate of Innocent III. the founders whereof were John de Matha, and Felix de Valois. His holiness gave them permission to establish this order for the deliverance of captives, who groaned under the tyranny of the infidels: he gave them, as a habit, a white gown ornamented with a red and blue cross. After the death of the two founders, pope Honorius III. continued the order, and their rule was approved by his successor Clement IV. in 1267. At first they were not permitted to eat flesh, and, when they travelled, were to ride only upon asses. But their rule was corrected and mitigated by the bishop of Paris, and the abbots of St. Victor and St. Genevieve, who allowed them to eat any kind of food, and to use horses. This order possesses about two hundred and fifty convents in thirteen different provinces: six of which are in France; namely, France, Normandy, Picardy, Champaine, Languedoc, and Provence; three in Spain, *viz.* New Castile, Old Castile, and Arragon; one is in Italy, and one in Portugal. There was formerly the province of England, where this order had forty-three houses; that of Scotland, where it had nine; and that of Ireland, where it had fifty-two; besides a great number of monasteries in Saxony, Hungary, Bohemia, and other countries. The convent of Cerfroy in France is head of the order.

TRINITY, in theology, the ineffable mystery of three persons in one God; Father, Son, and Holy Spirit.

Trinity sunday, a festival observed on the Sunday next after Whitsunday, in honour of the holy Trinity. The observation of this festival was first enjoined in the council of Arles, *anno* 1260.

Fraternity of the Trinity, a religious society instituted at Rome by St. Philip Neri, in 1548. These religious were appointed to take care of the pilgrims who came to visit the tombs of St. Peter and St. Paul. The society originally consisted of only fifteen religious, who assembled on the first Sunday of every month, in the church of St. Saviour del Campo, to hear the exhortations of the founder; after whose death pope Paul IV. gave the fraternity the church of St. Benedict, near which they have since built a large hospital, for the reception of pilgrims. The fraternity is one of the most considerable in Rome, and most of the nobility of both sexes have been members thereof.

TRIO, in musick, a part of a concert wherein three persons sing; or more properly a musical composition consisting of three parts.

TRIONES, in astronomy, a sort of constellation or assemblage of several stars in the ursa minor, commonly called Charles's wain.

TRIOPTERIS, in botany, a genus of the decandria trigynia

Fig. 1. Rectangular TRIGONOMETRY

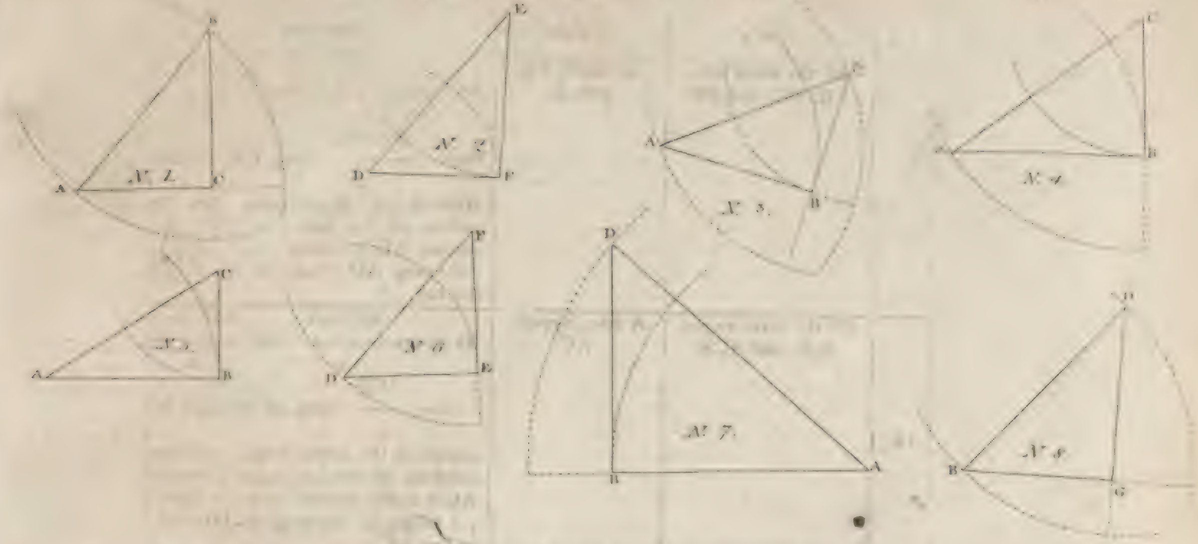


Fig. 2. Oblique angled TRIGONOMETRY

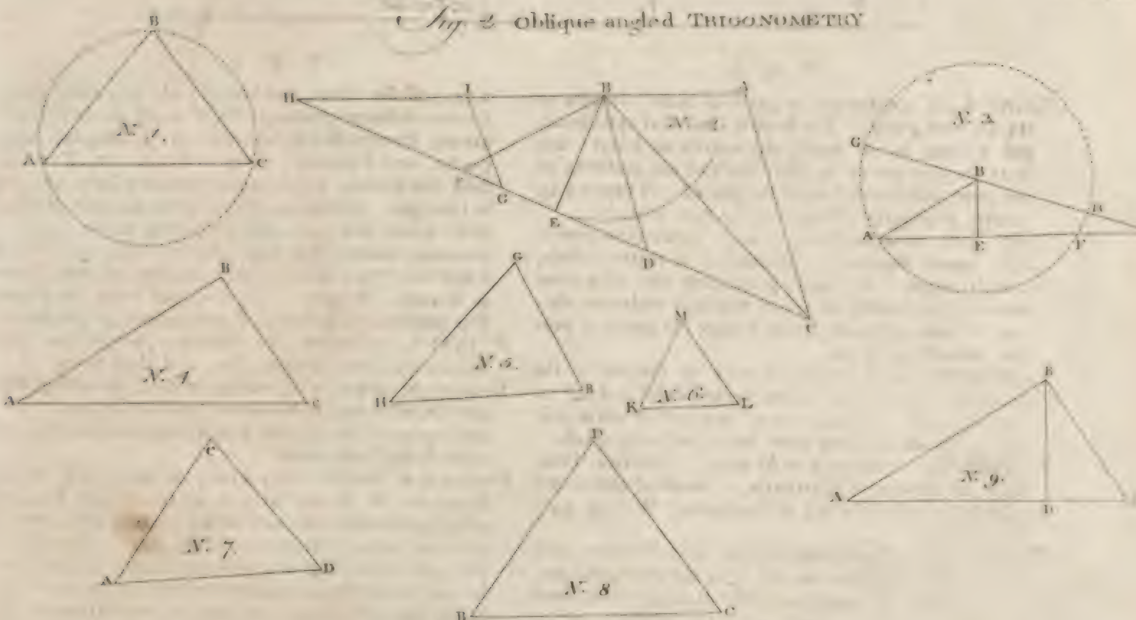
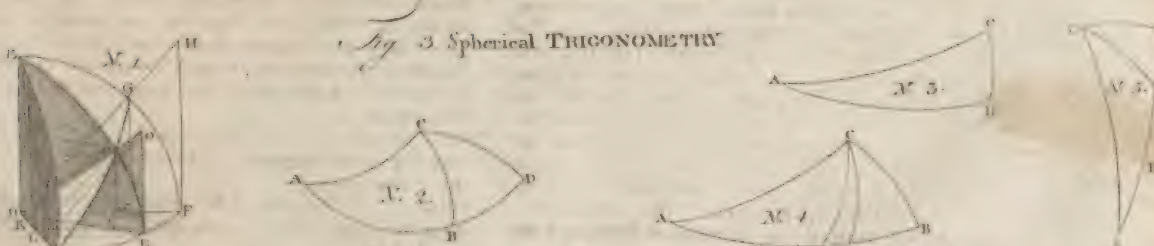


Fig. 3. Spherical TRIGONOMETRY



gynia clafs. The calix confifts of fix fegments; and there are three feeds, with a double membranous wing. There is but one fpecies, a native of Jamaica.

TRIP, a fea-term. A fhip is faid to bear her top-fails a-trip, when fhe carries them hoifted up to the higheft.

TRIPARTITE, fomething divided into three parts, or made by three parties, as indenture tripartite, *&c.*

TRIPARTITION, a divifion by three, or the taking the third part of any number or quantity.

TRIPHTHONG, in grammar, an affemblage or concourfe of three vowels in the fame fyllable, as *quæ*.

TRIPLE, in mufick, is one of the fpecies of meafure or time. See MUSICK.

TRIPOD, in antiquity, a famed facred feat or ftool, fupported by three feet, whereon the priefts and fibyls were placed to render oracles. It was on the tripod that the gods were faid to infpire the Pythians with that divine fury and enthufiafm wherewith they were feized at the delivery of their predictions.

TRIPOLI, a ftate of Africa, which including Barca, is bounded by the Mediterranean-fea on the north, by Egypt on the eaft, by Nubia and Bildulgerid on the fouth, and by Tunis on the weft: extending along the fhore of the Mediterranean from the north-weft to the fouth-eaft about a thoufand miles, but fcarce two hundred miles broad in any place. The city of Tripoli, being the capital of this ftate, is furrounded with a wall and other fortifications: E. long. 14° 30′, N. lat. 33° 30′.

TRIQUETROUS, among botanifts, expreffes a fruit or leaf that has three fides or faces all flat.

TRIREMIS, in antiquity, a gally with three ranks of oars on a fide.

TRISMEGISTUS, an epithet or furname given to one of the two Hermefes, or Mercuries, kings of Thebes in Egypt, who is faid to be contemporary with Mofes.

TRISPASTON, in mechanics, a machine with three pullies, or an affemblage of three pullies for raifing of great weights.

TRISYLLABLE, in grammar, a word confifting of three fyllables.

TRITICUM, in botany, a genus of the triandria digynia clafs. The calix confifts of two feffile valves, containing three flowers. There are eleven fpecies, only three of them natives of Britain, *viz.* the repens, or couch-grafs; the caninum, or bearded wheat-grafs; and the junceum, or fea wheat-grafs. For the culture of wheat, fee AGRICULTURE, p. 60.

TRITON, in zoology, a genus belonging to the order of vermes mollufca. The body is oblong; the tongue is fpiral; it has 12 tentacula, fix on each fide, the hindmoft ones having claws like a crab. There is but one fpecies, found in holes of rocks about the fea-fhore.

TRITON, a fea demi-god, held by the ancients to be an officer or trumpeter of Neptune, attending on him, and carrying his orders and commands from fea to fea.

TRITURATION, the act of reducing a folid body into a fubtile powder; called alfo levigation and pulverization.

TRIUMFETTA, in botany, a genus of the dodecandria monogynia clafs. The corolla confifts of five petals, and the calix of five leaves; and the capfule is hairy, and opens in four parts. There are two fpecies, both natives of India.

TRIUMPH, in Roman antiquity, a public and folemn honour conferred by the Romans on a victorious general, by allowing him a magnificent entry into the city.

The greater triumph, called alfo curulis, or fimply the triumph, was decreed by the fenate to a general, upon the conquering of a province, or gaining a fignal victory. The day appointed for the ceremony being arrived, fcaffolds were erected in the forum and circus, and all the other parts of the city, where they could beft behold the pomp: the fenate went to meet the conqueror without the gate called Capena or Triumphalis, and marched back in order to the capitol; the ways being cleared and cleanfed by a number of officers and tipftaffs, who drove away fuch as thronged the paffage, or ftraggled up and down. The general was clad in a rich purple robe, interwoven with figures of gold, fetting forth his great exploits; his bufkins were befet with pearl; and he wore a crown, which at firft was only laurel, but afterwards gold; in one hand he bore a branch of laurel, and in the other a truncheon. He was drawn in a magnificent chariot, adorned with ivory and plates of gold, drawn ufually by two white horfes; though fometimes by other animals, as that of Pompey, when he triumphed over Africa, by elephants; that of Marc Antony, by lions; that of Heliogabalus, by tygers; that of Aurelian, by deer, *&c.* His children were at his feet, and fometimes on the chariot-horfes. The proceffion was led up by the muficians, who played triumphal pieces, in praife of the general: thefe were followed by young men, who led the victims to the facrifice, with their horns gilded, and their heads adorned with ribbands and garlands; next came the carts and waggons, loaded with all the fpoils taken from the enemy, with their horfes, chariots, *&c.* thefe were followed by the kings, princes, and generals, who had been taken captives, loaden with chains: after thefe appeared the triumphal chariot, before which, as it paffed, they all along ftrewed flowers, and the people, with loud acclamations, called out *Io triumphe!* The chariot was followed by the fenate, clad in white robes; and the fenate by fuch citizens as had been fet at liberty or ranfomed: and the proceffion was clofed by the priefts and their officers and utenfils, with a white ox led along, for the chief victim. In this order they proceeded through the triumphal gate, along the via facra, to the capitol, where the victims were flain. In the mean time all the temples were open, and all the altars loaded with offerings and incenfe; games and combats were celebrated in the public places, and rejoicings appeared every where.

TRIUMVIR, one of three perfons who govern abfolutely, and with equal authority, in a ftate. It is chiefly applied to the Roman government: Cæfar, Pompey, and Craffus were the firft triumvirs, who divided the government amongft them. There were alfo other officers, called triumvirs; as the triumviri or trefviri capitales, who were the keepers of the public goal: they had the office of punifhing malefactors; for which purpofe they kept eight lictors under them.

TRIUMVIRATE, an abfolute government, adminiftered by three perfons with equal authority. See the preceding article.

TROCHANTER, in anatomy. See ANATOMY, p. 182.

TROCHE, in pharmacy, a fort of medicine, made of glutinous fubftances, into little cakes, and afterwards exficcated.

TROCHAN-

TROCHÆUS, in the Greek and Latin poetry, a foot consisting of two syllables, the first long, and the second short.

TROCHILUS, in ornithology, a genus belonging to the order of picæ. The beak is subulated and thread-shaped, with a tubular apex, and longer than the head, the superior mandible sheathing the inferior; the tongue is thread-shaped; and the feet are fitted for walking. This genus comprehends all the humming birds, which are the smallest of birds, and are distinguished by their colour and the shape of their bills.

TROCHLEA, one of the mechanical powers, usually called a pulley. See MECHANICS.

TROCHLEARES, in anatomy. See ANATOMY, p. 290.

TROGLODYTES, in the ancient geography, a people of Æthiopia, said to have lived in caves under ground. Pom. Mela gives a strange account of the Troglodytes: he says, they did not so properly speak as shriek, and that they lived on serpents.

TROJA, or TROJAN GAMES, were games said to be instituted by Ascanius, son of Æneas, and afterwards kept up by the Romans with great solemnity. They were celebrated by companies of boys, neatly dressed, and furnished with little arms and weapons, who mustered in the public circus. They were chosen, for the most part, out of the noblest families of Rome, and the captain of them had the honourable title of princeps juventutis, being sometimes next heir to the empire, and seldom less than the son of a principal senator.

TROIS RIVIERES, a town of North America, in the province of Canada, situated on the river of St. Laurence, fifty miles south of Quebec: W. long. 75°, and N. lat. 46° 45′.

TRONAGE, an ancient customary toll, paid for weighing of wool. This word is particularly mentioned in a charter granted to the mayor and citizens of London; in which city there is an officer called tronator, whose business it is to weigh the wool that is brought thither.

TRONCONNEE, in heraldry, denotes a cross, or other thing, cut in pieces and dismembered, yet so as all the pieces keep up the form of a cross, though set at a small distance from one another.

TROOP, a small body of horse or dragoons, about fifty or sixty, sometimes more, sometimes less; commanded by a captain. Each troop, besides a captain, has a lieutenant, cornet, quarter-master, and three corporals, who are the lowest officers of a troop.

TROPÆOLUM, in botany, a genus of the octandria monogynia class. The calix consists of one calcarated leaf; and the corolla of five unequal petals; and there are three dry berries. The species are three, all natives of Peru.

TROPE, in rhetoric, a kind of figure of speech, whereby a word is removed from its first and natural signification, and applied with advantage to another thing, which it does not originally mean; but only stands for it, as it has a relation to or connection with it: as in this sentence, *God is my rock*. Here the trope lies in the word *rock*, which being firm and immoveable, excites in our minds the notion of God's unfailing power, and the steady support which good men receive from their dependence upon him.

TROPHY, among the ancients, a pile or heap of arms of a vanquished enemy, raised by the conqueror in the most eminent part of the field of battle.

TROPICS, in astronomy. See ASTRONOMY, p. 469.

TROUT, in ichthyology. See SALMO.

TRUFFLES. See LYCOPERDON.

TRUMPET, a musical instrument, the most noble of all portable ones of the wind kind, used chiefly in war among the cavalry, to direct them in the servise.

TRUNCATED, in general, is an appellation given to such things as have, or seem to have, their points cut off: thus we say, a truncated cone, pyramid, leaf, *&c.*

TRUNCHEON, a short staff, or battoon, used by kings, generals, and great officers, as a mark of their command.

TRUNDLE, a sort of carriage with low wheels, whereon heavy and cumbersome burdens are drawn.

TRUNK, among botanists, denotes the stem, or body, of a tree; or, that part between the ground and the place where it divides into branches.

TRUNNIONS, or TRUNIONS *of a piece of ordnance*, are those knobs or bunches of the gun's metal, which bear her up on the cheeks of the carriage.

TRUSS, a bundle, or certain quantity of hay, straw, *&c.*

A truss of hay is to contain fifty-six pounds, or half an hundred weight; thirty-six trusses make a load.

TRUSS is also used for a sort of bandage or ligature, made of steel, or the like matter, wherewith to keep up the parts in those who have hernias or ruptures.

TRUSTEE, one who has an estate, or money, put or trusted in his hands for the use of another.

TRUTH, a term used in opposition to falshood, and applied to propositions which answer, or accord, to the nature and reality of the thing whereof something is affirmed or denied.

TUB, in commerce, denotes an indeterminate quantity or measure: thus, a tub of tea contains about sixty pounds; and a tub of camphor from fifty-six to eighty pounds.

TUBE, in general, pipe, conduit, or canal; a cylinder hollow withinside, either of lead, iron, wood, glass, or other matter, for the air, or some other fluid, to have a free passage or conveyance through.

TUBERCLE, in botany, a kind of round turgid root, in form of a knob or turnip.

The plants which produce such roots are hence denominated tuberose, or tuberous, plants.

TUBERCLES, among physicians, denote little tumours which suppurate and discharge pus, and are often found in the lungs, especially of consumptive persons.

TUBIPORA, a genus of submarine plants, belonging to the cryptogamia class, of the hardness of coral, and consisting of cylindric tubes rising from a thin crust of the same sort of matter with themselves.

TUBULI LACTIFERI, in anatomy. See ANATOMY, p. 277.

TUCUMAN, the south-west division of the province of La Plata, or Paraguay, in South America.

TULIPA, in botany, a genus of the hexandria monogynia class. The corolla is bell-shaped, and consists of six petals; it has no stylus. There are three species, none of them natives of Britain.

TUMEFACTION, the act of swelling or rising into a tumour

TUMOUR, in medicine and surgery, a preternatural rising

rising or eminence on any part of the body. See SURGERY, p. 663.

TUN, a large vessel or cask of an oblong form, biggest in the middle, and diminishing towards its two ends, girt about with hoops, and used for stowing several kinds of merchandize, for convenience of carriage; as brandy, oil, sugar, skins, hats, &c. This word is also used for certain vessels of extraordinary bigness, serving to keep wine in for several years.

TUN is also a certain weight whereby the burden of ships, &c. are esteemed.

TUNBRIDGE, a town of Kent, situated thirty-three miles west of Canterbury, much resorted to on account of its excellent waters.

TUNICA, a kind of waistcoat, or under garment, in use amongst the Romans. They wore it within doors by itself, and abroad under the gown. The common people could not afford the toga, and so went in their tunics, whence Horace calls them popellus tunicatus.

TUNICA, in anatomy, is applied to the membranes which invest the vessels, and divers others of the less solid parts of the body; thus the intestines are formed of five tunics, or coats.

TUNIS, the capital of the kingdom of Tunis, thirty miles south of Carthage ruins, 300 miles east of Algiers, and 120 south-west of Trapano, in Sicily; a populous city, about three miles in circumference: E. long. 10° N. lat. 36° 20′. The kingdom of Tunis is situated on the coast of Barbary, in Africa, being bounded by the Mediterranean sea on the north. It extends 200 miles in length from east to west, along the shore of the Mediterranean; the breadth is very unequal.

TUNNAGE is used for a custom or impost, payable to the crown, for goods and merchandize imported or exported, and is to be paid after a certain rate for every tun thereof. This duty, as well as that of poundage, was first granted for life to king Charles II and has been continued in the same manner to his royal successors, down to his present majesty king George III.

TURBAN, the head-dress of most of the eastern nations. It consists of two parts, a cap, and a sash of fine linen, or taffety, artfully wound in divers plaits about the cap. The cap has no brim, is pretty flat, though roundish at top, and quilted with cotton, but does not cover the ears. There is a good deal of art in giving the turban a fine air, and the making of them is a particular trade. The sash of the Turks turban is white linen; that of the Persians red woollen. These are the distinguishing marks of their different religions. Sophi, king of Persia, being of the sect of Ali, was the first who assumed the last colour, to distinguish himself from the Turks, who are of the sect of Omar, and whom the Persians esteem heretics.

TURBINATED, is a term applied by naturalists, to shells which are spiral, or wreathed, conically, from a larger basis to a kind of apex.

TURBITH, or TURPETH-ROOT, in the materia medica, the cortical part of the root of an Indian convolvulus, brought to us in oblong pieces, of a brown or ash-colour on the outside, and whitish within: the best is ponderous, not wrinkled, easy to break, and discovering a large quantity of resinous matter to the eye: its taste is at first sweetish; when chewed for a little time, it becomes acid, pungent, and nauseous. This root is a cathartic, not of the safest, or most certain kind.

TURBITH-MINERAL. See CHEMISTRY, p. 139.

TURBO, in zoology, a genus of insects belonging to the order of vermes testacea. This is an animal of the snail kind; the shell consists of one spiral solid valve; and the aperture is orbicular. There are 49 species, distinguished by peculiarities in their shells.

TURBOT, in ichthyology. See PLEURONECTES.

TURCICA TERRA, TURKY-EARTH, in the materia medica, a very fine bole or medicinal earth, dug in great plenty in the neighbourhood of Adrianople, and used by the Turks as a sudorific and astringent, and famous among them in pestilential diseases.

TURCOISE, in natural history, an ore of copper.

There are, indeed, two kinds of turcois; the one a true and genuine ore of copper; the other the bones of animals tinged to a beautiful blue colour, by having been buried in places where copper-ore has been near them.

TURCOMANIA, a province of Asiatic Turky, bounded by Persia on the east, and answers to the ancient Armenia; its capital is Erzerum.

TURDUS, in ornithology, a genus belonging to the order of passeres. The bill is somewhat cylindrical and cultrated; the nostrils are naked; the faux is ciliated; and the tongue is lacerated. There are 28 species, principally distinguished by their colour.

TURENNE, a town of Guienne, in France: E. long. 1° 20′, and N. lat. 45° 7′.

TURGESCENCE, among physicians, denotes a swelling, or growing bloated.

TURIN, the capital of Piedmont, in Italy, and of the king of Sardinia's dominions, is situated at the confluence of the rivers Po and Doria, 100 miles south-west of Milan: E. long. 7° 16′, and N. lat. 44° 50′.

TURIONES, among herbalists, denotes the first young tender shoots which plants annually put forth.

TURKEY, in ornithology. See MELEAGRIS.

TURKY, a very extensive empire, comprehending some of the richest countries in Europe, Asia, and Africa.

Turky in Europe, comprehends Romania, Bulgaria, Servia, Bosnia, Ragusa, Wallachia, Moldavia, Bessarabia, Budziac, Crim, and little Tartary, with Albania, Epirus, Macedonia, Thessaly, and all the ancient Greece, with its numerous islands. See ROMANIA, &c.

Turky in Asia, comprehends Natolia, Diarbeck, Syria, Turcomania, and part of Georgia and Arabia.

And Turky in Africa, comprehends the fruitful and extensive country of Egypt.

TURMERIC, in the materia medica, the root of a plant, called by botanists curcuma. See CURCUMA.

TURNEP, in botany, a species of brassica. For the culture of them, see AGRICULTURE, p. 67.

TURNERA, in botany, a genus of the pentandria trigynia class. The calix is funnel-shaped, and consists of five segments; there are five petals inserted into the calix; the stigmata are divided into many parts; and the capsule has one one cell. There are three species, none of them natives of Britain.

TURNING, a branch of sculpture, being the art of fashioning hard bodies, as brass, ivory, wood, &c. into a round or oval form, in a lathe.

TURNSOLE, in botany. See CROTON.

TURPENTINE, a tranſparent ſort of reſin, flowing either naturally or by inciſion from ſeveral unctuous and reſinous trees, as the terebinthus, larch, pine, fir, *&c.*

The turpentine of Chio or Scio, which is the only genuine kind, and that which gives the denomination to all the reſt, is a whitiſh reſin, bordering a little on green, very clear, and a little odoriferous; drawn by inciſion from a tree called terebinthus, very common in that iſland, as alſo in Cyprus, and ſome parts of France and Spain.

The uſes of turpentine in medicine are innumerable. It is a great vulnerary, and very detergent, and as ſuch is preſcribed in abſceſſes, ulcerations, *&c.* It promotes expectoration, and as ſuch is preſcribed in diſeaſes of the lungs and breaſt; but it is moſt famous for clearing the urinary paſſages, and as ſuch preſcribed in obſtructions of the reins, in gonorrhœas, *&c.*

Oil of TURPENTINE. There are two kinds of oil drawn from turpentine, by diſtillation; the firſt white, the ſecond red, both eſteemed as balſams proper for the cure of wounds, chilblains, *&c.* But they are ſo little uſed among us, that it is not eaſy to procure either of them.

What is commonly ſold under the name of oil of turpentine, or etherial oil, is only a diſtillation of the reſinous juice of the tree, freſh as it is gathered. It is uſed with ſucceſs in the cure of green wounds, as alſo by the painters, farriers, *&c.* To be good, it muſt be clear and pellucid as water, of a ſtrong penetrating ſmell, and very inflammable.

TURRITIS, in botany, a genus of the tetradynamia ſiliquoſa claſs. The pod is very long, and angular; the calix is connivent and erect; and the corolla is erect. There are two ſpecies, both natives of Britain, *viz.* the glabra, or great tower-muſtard; and the hirſuta, or hairy tower-muſtard.

TURTLE, in ichthyology. See TESTUDO.

TUSCAN ORDER, in architecture. See ARCHITECTURE, p. 351.

TUSCAN EARTH, in the materia medica, a yellowiſh, white, pure bole, conſiderably heavy, of a very ſmooth ſurface, not eaſily breaking between the fingers, but adhering ſlightly to the tongue, and melting very readily in the mouth. It is dug in many parts of Italy, particularly about Florence, where there is a ſtratum of it eight or ten feet thick, at the depth of five or ſix from the ſurface. It is given as a ſudorific, and eſteemed a great medicine in fevers, attended with diarrhœas.

TUSCANY, a duchy of Italy, encompaſſed by the pope's territories on the north-eaſt and ſouth, and bounded by the Tuſcan Sea on the ſouth-weſt, and by the territories of Lucca and Modena on the north-weſt, being 100 miles long, and almoſt as many broad.

TUSSILAGO, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus is ſimple; the ſcales of the calix are equal, and ſomewhat membranaceous. There are nine ſpecies; three of them natives of Britain, *viz.* the farfara, or common colt's foot; the hybrida, or long-ſtalked butter-bur; and the petaſitas, or common butter bur.

The common colt's foot ſtands recommended in coughs and other diſorders of the breaſt and lungs.

TUTOR. See LAW, Tit. vii. 1, *&c.*

TUTTY, a recrement of mixed metals, in which lapis calaminaris, or zink in its metallic form, is an ingredient; collected in the furnaces where braſs is made from copper and calamine, and where the mixed metals are run. In theſe furnaces they place, under the roof and about the upper parts of the ſides, rods of iron, and ſometimes rolls of dry earth, about which the tutty is afterwards found. Therefore the tutty which we uſe in the ſhops at this time, owes its origin truly and properly to zink, which ſublimes with a very ſmall fire into a kind of flowers, and, when fuſed with any other metal, flies from it in abundance under this form, and alſo frequently takes ſome part of the metal, more or leſs, up with it. Hence it is evident, that the tutty or cadmia of the ancients, muſt have been wholly different from ours, as they uſed no zink nor any of its ores in the furnace where they collected it.

Our tutty then is a hard and heavy ſemimetallic recrement, ſometimes met with in the ſhops in thin flat pieces or flakes, but moſt abundantly in tubular cylindric pieces, reſembling ſegments of the barks of trees puſhed off from the branches without breaking; theſe are of different lengths and diameters. The fineſt tutty is that of a fine deep brown on the outſide, and of a yellowiſh tinge within; the thickeſt, brighteſt, and moſt granulated; the hardeſt to break, and that which has leaſt foulneſs among it.

Tutty is celebrated as an ophthalmic, and frequently employed as ſuch in unguents and collyria.

TUXFORD, a market-town of Nottinghamſhire, twenty miles north-eaſt of Nottingham.

TWEED, a river of Scotland, which riſes on the confines of the ſhire of Clydeſdale, and running eaſtward through Tweedale, and dividing the ſhire of Mers from Tiviotdale and Northumberland, falls into the German ſea at Berwick.

TWEEDALE, a county of Scotland, bounded by Lothian on the north, by Mers and Tiviotdale on the eaſt, by Annandale on the ſouth, and Clydeſdale one the weſt.

TWEER, a city of Ruſſia, capital of the province of Tweer, ſituated on the river Wolgo, ninety miles north of Moſcow, in E. long. 30° 37′, N. lat. 57° 25′.

TWELFTH-DAY, the feſtival of the epiphany, or the manifeſtation of Chriſt to the Gentiles; ſo called, as being the twelfth day, excluſive, from the nativity or Chriſtmas-day

TWILIGHT, that light, whether in the morning before ſun-riſe, or in the evening after ſun-ſet, ſuppoſed to begin and end when the leaſt ſtars that can be ſeen by the naked eye ceaſe, or begin to appear. By means of the atmoſphere it happens, that though none of the ſun's direct rays can come to us after it is ſet, yet we ſtill enjoy its reflected light for ſome time, and night approaches by degrees. For after the ſun is hid from our eyes, the upper part of our atmoſphere remains for ſome time expoſed to its rays, and from thence the whole is illuminated by reflection.

TWINS, two young ones delivered at a birth, by an animal which ordinarily brings forth but one.

TYGER, or TIGER, in zoology. See LEO.

TYLE, or TILE, in building, a ſort of thin laminated brick, uſed on the roofs of houſes; or more properly a

kind

kind of fat clayey earth, kneaded and moulded, of a juſt thickneſs, dried and burnt in a kiln like brick, and uſed in the covering and paving of houſes.

TYMPAN *of an arch*, is a triangular ſpace or table in the corners or ſides of an arch, uſually hollowed, and enriched ſometimes with branches of laurel, olive-tree, or oak, or with trophies, *&c.* ſometimes with flying figures, as fame, *&c.* or ſitting figures, as the cardinal virtues.

TYMPAN, among printers, a double frame belonging to the preſs, covered with parchment, on which the blank ſheets are laid in order to be printed off. See PRINTING-PRESS.

TYMPANUM, in mechanics, a kind of wheel placed round an axis or cylindrical beam, on the top of which are two levers or fixed ſtaves, for the more eaſy turning the axis, in order to raiſe a weight required. The tympanum is much the ſame with the peritrochium, but that the cylinder of the axis of the peritrochium is much ſhorter, and leſs than the cylinder of the tympanum.

TYPANUM, in anatomy. See ANATOMY, p. 296.

TYMPANY, in medicine. See MEDICINE, p. 110.

TYPE, a copy, image, or reſemblance of ſome model. The word is much uſed among divines, to ſignify a ſymbol, ſign, or figure of ſomething to come; in which ſenſe it is commonly uſed with relation to antitype, which is the thing itſelf, whereof the other is a type or figure.

TYPE, among letter-founders and printers, the ſame with letter. See LETTER.

TYPE is alſo uſed to denote the order obſerved in the intenſion and remiſſion of fevers, pulſes, *&c.*

TYPHA, in botany, a genus of the monoecia triandria claſs. The amentum of both male and female is cylindrical; the calix of the male conſiſts of three leaves; and neither of them have any corolla. There are two ſpecies, both of them natives of Britain, *viz.* the latifolia, or great cat's-tail; and anguſtifolia, or narrow-leaved cat's-tail.

TYPHODES, in medicine, a kind of ardent or burning fever uſually attending on eryſipelaſes of any of the viſcera.

TYPOGRAPHY, the art of printing. See PRINTING.

TYRANT, among the ancients, denoted ſimply a king or monarch. But the ill uſe ſeveral perſons inveſted with that ſacred character made of it, has altered the import of the word; and tyrant now carries with it the idea of an unjuſt and cruel prince, who invades the peoples liberty, and rules in a more deſpotic manner than the laws of nature or the country do allow of.

TYRE, a port-town of Phœnicia, in Aſiatic Turky, ſituated on the coaſt of the Levant, in E. long. 36°, N. lat. 32° 32′, being anciently the capital of Phœnicia.

TYRONE, an Iriſh county, in the province of Ulſter; bounded by Londonderry, on the north; by Armagh and Laugh-neah, on the eaſt; by Monaghan and Fermanagh, on the ſouth; and by Donnagal on the weſt.

U, V.

VACCINIUM, in botany, a genus of the octandria monogynia claſs. The calix is above the fruit; the corolla conſiſts of one petal; the filaments are inſerted into the receptacle; and the berry has four cells, containing many ſeeds. There are twelve ſpecies, five of them natives of Britain, *viz.* the myrtillis, or black whortleberries or bilberries; the uliginoſum, or great bilberry-buſh; the cantabricum, or Iriſh whorts; the vitis idea, or red whorts; and the oxycoccus, or craw-berries.

VACUUM, in philoſophy, denotes a ſpace empty or devoid of all matter or body.

VAGINA, properly ſignifies a ſheath, or ſcabbard: and the term vagina is uſed, in architecture, for the part of a terminus, becauſe reſembling a ſheath, out of which the ſtatue ſeems to iſſue.

VAGINA, in anatomy, a large canal, formed of a robuſt or ſtrong membrane, and reaching from the external orifice, or os pudendi, in women, to the uterus. See ANATOMY.

VAGUM, or PAR VAGUM. See ANATOMY, 249.

VAIR, in heraldry, a kind of fur, conſiſting of divers little pieces, argent, and azure, reſembling a dutch U, or a bell glaſs. See Plate CXLVII. fig. 21.

VAIRY, in heraldry, expreſſes a coat, or the bearings of a coat, when charged or chequered with vairs: and hence, vairy-cuppy, or vairy-taſſy, is a bearing compoſed of pieces repreſenting the tops of crutches. See Plate CXLVII. fig. 22.

VALAIS, a territory of Switzerland, being a long valley of an hundred miles extent, lying between the head of the river Rhone and the lake of Geneva.

VALANTIA, in botany, a genus of the polygamia monœcia claſs. Neither the hermaphrodite or male have any calix; the corolla of each conſiſts of four ſegments; there are four ſtamina; the ſtylus of the hermaphrodite is bifid, and it has but one ſeed. There are three ſpecies, only one of them, *viz.* the cruciata or croſs-wort, a native of Britain.

VALENCIA, the capital of a province of the ſame name, in Spain, ſituated in a fine plain on the river Guadalaviar: W. long. 35′, N. lat. 39° 20′.

VALENTINIANS, in church-hiſtory, a ſect of Chriſtian heretics, who ſprung up in the IId century, and were ſo called from their leader Valentinus.

The Valentinians were only a branch of the Gnoſtics, who realized or perſonified the platonic ideas concerning the deity, whom they called Pleroma, or plenitude. Their ſyſtem was this: the firſt principle is Bythos, *i. e.* depth, which remained many ages unknown, having with

it Ennoe or thought, and Sige or silence; from these sprung the Nous, or intelligence, which is the only son, equal to, and alone capable of comprehending, the Bythos; the sister of Nous they called Alethia, or truth: and these constituted the first quaternity of æons, which were the source and original of all the rest: for Nous and Alethia produced the world and life; and from these two proceeded man and the church. But besides these eight principal œons, there were twenty two more; the last of which, called Sophia, being desirous to arrive at the knowledge of Bythos, gave herself a great deal of uneasiness, which created in her Anger and Fear, of which was born Matter. But the Horos, or bounder, stopped her, preserved her in the pleroma, and restored her to her perfection. Sophia then produced the Christ and the Holy Spirit, which brought the æons to their last perfection, and made every one of them contribute their utmost to form the Saviour. Here Enthymese, or thought, dwelling near the Pleroma, perfected by the Christ, produced every thing that is in the world, by its divers passions. The Christ sent into it the Saviour, accompanied with angels, who delivered it from its passions, without annihilating it: from thence was formed corporeal matter. And in this manner did they romance, concerning God, nature, and the mysteries of the Christian religion.

VALERIANA, in botany, a genus of the triandria monogynia class. It has no calix; the corolla consists of one petal, gibbous at the base, and situate above the fruit. There are 20 species, three of them natives of Europe, *viz.* the officinalis, or great wild valerian, whose root is alexipharmic, sudorific, and diuretic; the dioica, or marsh valerian; and the locusta, or lambs-lettuce.

VALET, a French term, used as a common name for all domestic men servants, employed in the more servile offices, as grooms, footmen, coachmen, *&c.*

VALETUDINARY, among medical writers, denotes a person of a weak and sickly constitution, and frequently out of order.

VALID, in law, an appellation given to acts, deeds, transactions, *&c.* which are clothed with all the formalities requisite to their being put into execution.

VALLADOLID, a city of Old Castile, in Spain, eighty-six miles north-west of Madrid: W. long. 4° 50′, and N. lat. 41° 36′.

VALLENGIN, the capital of a county of the same name, in Switzerland, situated near the lake of Neufchattel, twenty five miles north-west of Bern.

VALLISNERIA, in botany, a genus of the diœcia diandria class. The spatha both of male and female consists of two segments, and the corolla of three petals; the spadix of the male is covered with floscules; the capsule has one cell, containing many seeds; and there are three styli. There is but one species, a native of Italy

VALOIS, a duchy of France, situated on the three great rivers, the Seine, the Marne, and the Oyse.

VALUE, in commerce, denotes the price or worth of any thing.

VALUED RENT, in Scots law. See LAW, Tit. xii. 6.

VALVE, in hydraulics, pneumatics, *&c.* is a kind of lid, or cover, of a tube or vessel, so contrived as to open one way; but which, the more forcibly it is pressed the other way, the closer it shuts the aperture; so that it either admits the entrance of a fluid into the tube or vessel, and prevents its return; or admits its escape, and prevents its re-entrance.

VALVE, in anatomy, a thin membrane applied on several cavities and vessels of the body, to afford a passage to certain humours going one way, and prevent their reflux towards the place from whence they came.

VAN, a term derived from the French *avant*, or *avaunt*, signifying *before*, or *foremost* of any thing: thus we say, the van-guard of an army, *&c.*

VANDALIA, the ancient name of the countries of Mecklenburg and Pomerania, in Germany.

VANELLUS, in ornithology. See TRINGA.

VAPOUR, in philosophy, the moist and most volatile particles of bodies, separated by heat, and raised into the atmosphere. See RAIN.

VAPOURS, in medicine, a disease properly called hypo, or the hypochondriacal disease, and in men particularly the spleen. See MEDICINE, p. 148.

VARI, in medicine, little hard and ruddy tumours, which frequently infest the faces of young persons of a hot temperament of body.

VARIATION, in geography and navigation, is the deviation of the magnetical needle, in the mariner's compass, from the true north point, towards either the east or west; or it is an arch of the horizon, intercepted between the meriadian of the place of observation and the magnetic meridian. See NAVIGATION.

VARIEGATION, among botanists and florists, the act of streaking or diversifying the leaves, *&c.* of plants and flowers with several colours.

Variegation is either natural or artificial. Of natural variegation there are four kinds; the first shewing itself in yellow spots here and there in the leaves of plants called by gardeners the yellow bloach. The second kind, called the white bloach, marks the leaves with a great number of white spots or stripes; the whitest lying next the surface of the leaves, usually accompanied with other marks of a greenish white, that lie deeper in the body of the leaves. The third, and most beautiful, is where the leaves are edged with white, being owing to some disorder or infection in the juices, which stains the natural complexion or verdure of the plant. The fourth kind is that called the yellow edge.

Artificial variegation is performed by inarching or inoculating a striped or variegated plant into a plain one of the same sort; as a variegated common jessamin into a plain, common, Spanish, Brazil, or Indian jessamin.

A single bud or eye, Mr Bradly observed, being placed in the escutcheon of a distempered tree, where it can only receive nourishment from the vitiated juices, will become variegated proportionably to the nourishment it draws; and will partake more of the white and yellow juice, than if a branch shall be inarched, the bud having nothing to nourish it but the juices of the plant it is inoculated on; whereas a cyon inarched is fed by the striped plant, and the healthful one.

As to the natural stripes and variegations, there are some particular circumstances to be observed: 1. That some plants only appear variegated or bloached in the spring and autumn, the stains disappearing as they gather strength: of this kind are rue, thyme, and marjoram. 2. Some plants are continually bloached in the spongy part of their

their leaves, the ſap-veſſels all the time remaining of a healthful green; which, being ſtrengthened by rich manure, or being inarched in healthful plants, throw off the diſtemper. 3. In other plants, the diſeaſe is ſo rooted and inveterate, that it is propagated with the ſeed; ſuch are the arch-angel, water-betony, bark-creſs, borrage, ſtriped cellary, and ſycomore; the ſides of which produce ſtriped plants.

VARIOLÆ, the SMALL-POX. See MEDICINE, p. 75.

VARIX, in medicine, the dilatation of a vein, ariſing from the too great abundance or thickneſs of the blood.

VARNISH, a thick, viſcid, ſhining liquor, uſed by painters, gilders, and various other artificers, to give a gloſs and luſtre to the works; as alſo to defend them from the weather, duſt, *&c.*

There are ſeveral kinds of varniſhes in uſe; as the ſiccative or drying varniſh, made of oil of aſpin, turpentine, and ſandarach melted together. White varniſh, called alſo Venetian varniſh, made of oil of turpentine, fine turpentine, and maſtic. Spirit of wine varniſh, made of ſandarach, white amber, gum elmi, and maſtic; ſerving to gild leather, picture-frames, *&c.* withal.

1. To make the white varniſh: take gum ſundarach, of the cleareſt and whiteſt ſort, eight ounces; gum maſtic, of the cleareſt ſort, half an ounce; of ſarcocolla, the whiteſt, three quarters of an ounce; Venice turpentine, an ounce and a half; benzoin, the cleareſt, one quarter of an ounce: white roſin, one quarter of an ounce; gum animæ, three quarters of an ounce: let all theſe be diſſolved, and mixed in the manner following:

Put the ſarcocolla and roſin into a little more ſpirits than will cover them to diſſolve; then add the benzoin, gum animæ, and venice-turpentine, into either a glaſs or glazed earthen veſſel, and pour on as much ſpirits as will cover them an inch; then put the gum maſtic into a glaſs or glazed veſſel, and pour ſtrong ſpirits upon it, covering it alſo about an inch thick, to diſſolve it rightly; then put your gum elemi into a diſtinct veſſel as before, and cover it with ſpirits to diſſolve.

For this purpoſe, you need only break the roſin a little, and powder the gum animæ, ſarcocolla, and benzoin.

Let all ſtand three or four days to diſſolve, ſhaking the glaſſes, *&c.* two or three times a-day, and afterwards put them all together into a glazed veſſel, ſtirring them well, and ſtrain the liquor and gums gently, beginning with the gums, through a linen cloth.

Then put it into a bottle, and let it ſtand a week before you uſe it, and pour off as much of the clear only, as you think ſufficient for preſent uſe.

A hard varniſh that will bear the muffle may be thus made: Take of colophony, an ounce; ſet it over the fire in a well-glazed earthen veſſel, till it is melted; then by little and little, ſtrew in two ounces of powder of amber, keeping it ſtirring all the while with a ſtick; and when you perceive it begin to harden or reſiſt the ſtick, then put in a little turpentine oil, which will thin and ſoften it immediately; then put in two ounces of gum copal, finely powdered, ſprinkling it in as you did the amber, now and then pouring in a little oil of turpentine; and when it is done, ſtrain it as before directed.

This is proper to varniſh over gold; and the things done with it muſt be ſet into a declining oven, three or four days ſucceſſively, and then it will reſiſt even the fire itſelf.

To make a varniſh for gold, or metals made in imitation of gold. Take colophony, and, having melted it, put in two ounces of amber finely powdered, and ſome ſpirit of turpentine; and, as the amber thickens, keep it well ſtirring: then put in an ounce of gum elemi, well pulverized, and more ſpirit of turpentine; conſtantly ſtirring the liquor till all is well mixed and incorporated: but take care, however, to uſe as little turpentine as you can, becauſe the thicker the varniſh is made, the harder it will be. Let this be done over a ſand-heat, in an open-glaſs; then ſtrain it, as is directed for the preceding varniſh. This varniſh is to be uſed alone, firſt warming the veſſels made of paper paſte; and lay it on with a painting-bruſh before the fire, but not too near, leſt the fire raiſe it into bliſters. After this has been done, harden it three ſeveral times in ovens; firſt with a ſlack heat, the next with a warmer, and the third with a very hot one; and the veſſels will look like poliſhed gold.

And as for ſuch veſſels, *&c.* as ſhall be made with ſaw-duſt and gums, the varniſh may be made of the ſame ingredients as above-mentioned, except the gum elemi; and this will dry in the ſun, or in a gentle warmth.

To make a varniſh for any thing covered with leaf-ſilver. Firſt paint the thing over with ſize, and ground chalk or whiting; let them ſtand till they are thoroughly dry, and then do them over with very good gold-ſize of a bright colour (for there is much difference in the colour of it, ſome being yellow, and others almoſt white; the firſt is moſt proper for gold, and the laſt for ſilver.) When this ſize is ſo dry as that it will juſt ſtick a little to the touch, lay on the leaf-ſilver, and cloſe it well to the ſize.

To make a varniſh for ſilver. Melt, in a well-glazed pipkin, ſome fine turpentine, and put in three ounces of white amber finely powdered (more or leſs, according to the quantity your work will require;) put it in by little and little, keeping it continually ſtirring, adding by degrees ſome ſpirit of turpentine, till all the amber is diſſolved; and then add to it an ounce of ſarcocolla well beaten, and an ounce of gum elemi well levigated, adding now and then a little ſpirit of turpentine, till all is diſſolved: do this over a gentle fire, and keep it conſtantly ſtirring.

This varniſh will be as white and ſtrong as the former; and is to be uſed warm, and hardened by degrees in an oven, as varniſhed gold, whereby it will look like poliſhed ſilver

Laying on of VARNISHES. 1. If you varniſh wood, let your wood be very ſmooth, cloſe-grained, free from greaſe, and rubbed with ruſhes. 2 Lay on your colours as ſmooth as poſſible; and, if the varniſh has any bliſters in it, take them off by a poliſh with ruſhes. 3. While you are varniſhing, keep your work warm, but not too hot. 4. In laying on your varniſh, begin in the middle, and ſtroke the bruſh to the outſide; then to another extreme part, and ſo on till all be covered: for if you begin at the edges, the bruſh will leave blots there, and make the work unequal. 5. In fine works uſe the fineſt tripoli in poliſhing: do not poliſh it at one time only; but after the firſt time, let it dry for two or three days, and poliſh it again for the laſt time. 6. In the firſt poliſhing, you muſt uſe a good deal of tripoli; but in the next a very little

little will ferve: when you have done, wafh off your tripoli with a fponge and water: dry the varnifh with a dry linen rag; and clear the work, if a white ground, with oil and whiting; or, if black, with oil and lamp-black.

Varnish alfo fignifies a fort of fhining coat, wherewith potter's ware, delf ware, china ware, *&c.* are covered, which gives them a fmoothnefs and luftre. Melted lead is generally ufed for the firft, and fmalt for the fecond.

Varnish, among medalifts, fignifies the colours antique medals have acquired in the earth.

The beauty which nature alone is able to give to medals, and art has never yet attained to counterfeit, enhances the value of them; that is, the colour, which certain foils, in which they have a long time lain, tinges the metals withal: fome of which are blue, almoft as beautiful as the turquoife; others with an inimitable vermilion colour; others with a certain fhining polifhed brown, vaftly finer than brafil figures.

The moft ufual varnifh is a beautiful green, which hangs to the fineft ftrokes without effacing them, more accurately than the fineft enamel does on metals.

No metal but brafs is fufceptible of this; for the green ruft that gathers on filver always fpoils it, and it muft be got off with vinegar or lemon-juice.

Falfifiers of medals have a falfe or modern varnifh, which they ufe on their counterfeits, to give them the appearance, or air, of being antique. But this may be difcovered by its foftnefs, it being foftner than the natural varnifh, which is as hard as the metal itfelf.

Some depofit their fpurious metals in the earth for a confiderable time, by which means they contract a fort of varnifh, which may impofe upon the lefs knowing; others ufe fal armoniac, and others burnt paper.

VAS, a veffel either for mechanical, chemical, culinary, or any other ufes. In anatomy, all the parts which convey a fluid are called veffels, as the veins, arteries, and lymphatics.

VASCULAR, fomething confifting of divers veffels; as arteries, veins, nerves, *&c.*

VASCULIFEROUS plants, fuch whofe feeds are contained in veffels, which are fometimes divided into cells.

VASE, a term frequently ufed for ancient veffels dug from under ground, or otherwife found, and preferved in the cabinets of the curious.

In architecture, the appellation vafe is alfo given to thofe ornaments placed on corniches, fochles, or pedeftals, reprefenting the veffels of the ancients, particularly thofe ufed in facrifice: as incenfe-pots, flower-pots, *&c.*

VASSAL, denotes a tenant that holds land in fee of his lord.

Vassal, in Scots law. See Law, Tit. x. 3.

VASTUS, in anatomy. See Anatomy, p. 207.

VATERIA, in botany, a genus of the polyandria monogynia clafs. The corolla confifts of five petals, and the calix of five fegments; the capfule has three valves, and one cell containing three feeds. There is but one fpecies, a native of India.

VATICAN, a magnificent palace of the pope, in Rome, which is faid to confift of feveral thoufand rooms: but the parts of it moft admired are the grand ftair-cafe, the pope's apartment; and efpecially the library, which is one of the richeft in the world, both in printed books and manufcripts.

VAUDEMONT, the capital of a county of the fame name in Lorrain, fifteen miles fouth-weft of Nancy.

VAUDOIS, are certain valleys fituated north of the marquifate of Saluzzo, in Italy: the chief town is Lucerne.

VAULT, in architecture, an arched roof, fo contrived that the ftones which form it fuftain each other.

Vaults are, on many occafions, to be preferred to foffits or flat ceilings, as they give a greater height and elevation, and are befides more firm and durable.

VAUR, a town of Languedoc, in France, eighteen miles weft of Touloufe.

UBEDA, a city of Andalufia, in Spain, forty-five miles north-eaft of Granada: W. long. 3° 6′, N. lat. 38°.

UBERLINGEN, a town of Swabia, in Germany, ten miles north of Conftance.

UBES, or *St.* Ubes, a city and port-town of Portugal, fituated on a fine bay, twenty-one miles fouth of Lifbon.

UBIQUITARIANS, in church-hiftory, a fect of heretics who fprung up in Germany about the year 1590, and maintained that the body of Jesus Chrift is *ubique*, everywhere, or in every place, at the fame time. However, they were not quite agreed among themfelves; fome holding, that the body of Jefus Chrift, even during his mortal life, was every where; and others dating the ubiquity of his body from the time of his afcenfion only.

UBIQUITY, omniprefence; an attribute of the Deity, whereby he is always intimately prefent to all things.

UDDER, that part in brutes wherein the milk is prepared; anfwering to the mammæ, or breafts, in women.

VECTOR, in aftronomy, a line fuppofed to be drawn from any planet moving round a centre, or the focus of an ellipfis, to that centre or focus.

VEDETTE, in the military art, a fentinel on horfeback, detached from the main body of the army to difcover and give notice of the enemy's defigns.

VEER, a fea term varioufly ufed. Thus veering out a rope, denotes the letting it go by hand, or letting it run out of itfelf. It is not ufed for letting out any running rope except the fheet.

Veer is alfo ufed in reference to the wind; for, when it changes often, they fay it veers about.

VEGETABLE, a term applied to all plants, confidered as capable of growth; *i. e.* all natural bodies which have parts organically formed for accretion, but not fenfation.

VEGETATION, the act whereby plants receive nourifhment, and grow. See Agriculture p. 40.

VEGETATIVE soul, among philofophers, denotes that principle in plants, by virtue of which they vegetate, or receive nourifhment and grow.

VEHICLE, in general, denotes any thing that carries or bears another along; but is more particularly ufed in pharmacy for any liquid ferving to dilute fome medicine, in order that it may be adminiftered more commodioufly to the patient.

VEIL, a piece of ftuff, ferving to cover or hide any thing.

In the Romifh churches, in time of Lent, they have veils or curtains over the altar, crucifix, images of faints, *&c.*

A veil or crape is worn on the head by nuns, as a badge of their profeffion: the novices wear white veils; but thofe who have made the vows black ones.

VEIN, in anatomy. See Anatomy, p. 237.

Vein, among miners, is that fpace which is bounded with woughs, and contains ore, fpar, canck, clay, chirt, croil, brownhen,

brownhen, pitcher-chirt, cur, which the philosophers call the mother of metals, and sometimes soil of all colours. When it bears ore, it is called a quick vein; when no ore, a dead vein.

VELA, a remarkable cape on the coast of Terra Firma, in W. long. 73° 30′, and N. lat. 12°.

VELARIUS, in antiquity, an officer in the court of the Roman emperors, being a kind of usher, whose post was behind the curtain in the prince's apartments; as that of the chancellor's was at the entry of the balustrade, and that of the ostiarii at the door. The velarii had a superior of the same denomination who commanded them.

VELAY, the north-east division of Languedoc, in France.

VELITES, in the Roman army, a kind of ancient soldiery, who were armed lightly with a javelin, a cask, cuirasse, and shield.

VELLEITY, in the school-philosophy, is usually defined a languid, cold, and remiss will. Others say, it implies an impotency of obtaining what we require.

VELLA, in botany, a genus of the tetradynamia siliculosa class. The dissepimentum of the pod is about twice as large as the valves, and oval on the outside. There are two species, only one of them, *viz.* the annua, or cress-rocket, a native of Britain.

VELOCITY, swiftness, or that affection of motion whereby a moving body is disposed to run over a certain space in a certain time. See MECHANICS, and HYDROSTATICS.

VELVET, a rich kind of stuff, all silk, covered on the outside with a close, short, fine, soft shag, the other side being a very strong close tissue.

The principal and best manufactories of velvet are in France and Italy, particularly in Venice, Milan, Florence, Genoa, and Lucca: there are others in Holland, set up by the French refugees, whereof that at Harlem is the most considerable; but they all come short of the beauty of those in France.

VENAL or VENOUS, among anatomists, *&c.* something that bears a relation to the veins.

This word is also used for something bought with money, or procured by bribes.

VENEERING, a kind of marquetry, or inlaying, whereby several thin slices or leaves of fine woods, of different kinds, are applied and fastened on a ground of some common wood

VENEREAL, something belonging to venery; as the lues venerea, *&c.*

VENERY, is used for the act of copulation, or coition, of the two sexes.

VENESECTION, or PHLEBOTOMY, in surgery. See SURGERY, p. 641.

VENETIAN BOLE, a fine red earth used in painting, and called in the colour-shops Venetian red.

It is dug in Carinthia, and sent from Venice to all parts of the world, being an excellent colour, and very cheap: our colour-men, however, find many ways of adulterating it.

VENEZUELA, a province of Terra Firma, lying on the northern ocean, and having new Andalusia on the east, new Granada on the south, and the river De la Hacha on the west.

VENIAL, in the Romish theology, a term applied to slight sins, and such as easily obtain pardon.

VENICE, the capital of a republic in Italy, of the same name, is situated in the Lagunes, or small islands, of the gulph of Venice, about five miles from the continent: E. long. 13°, and N. lat. 45° 40′.

Venice is so happily situated, that no army can approach it by land; the avenues to those islands being so exceeding difficult, that they have not thought it necessary to inclose the city with a wall.

Nothing can appear more beautiful than this city, as we approach it either from the continent or the sea, with its numerous palaces and lofty towers: its circumference is about six miles, and its inhabitants are computed at two hundred thousand.

VENIRE FACIAS, in law, is a judicial writ lying where two parties plead and come to issue; directed to the sheriff, to cause twelve men, of the same neighbourhood, to meet, and try the same, and to say the truth upon the issue taken.

VENT, VENT-HOLE, or SPIRACLE, a little aperture left in the tubes or pipes of fountains, to facilitate the air's escape; or, on occasions, to give them air, as in frosty weather, *&c.* for want of which they are apt to burst.

VENTER, in anatomy, the same with abdomen. See ANATOMY, p. 256.

VENTIDUCTS, in building, are spiracles or subterraneous places, where fresh, cool wind being kept, they are made to communicate, by means of tubes, funnels or vaults, with the chambers or other apartments of a house, to cool them in sultry weather.

VENTILATOR, a well-known machine, by which the noxious air of any close place, as an hospital, goal, ship, chamber, *&c.* may be changed for fresh air.

VENTRICLE, properly denotes any little cavity; but is more particularly used, by physicians and anatomists, for the stomach.

VENUS, in astronomy. See ASTRONOMY, p. 436.

VERA CRUZ, a port-town of Mexico, with a strong and commodious harbour, situated on the gulph of Mexico, in W. long. 100°, N. lat. 18° 30′.

VERAGUA, a province of Mexico, situated on the South Sea, westward of the gulph of Panama.

VERATRUM, in botany, a genus of the polygamia monoecia class. Neither male nor hermaphrodite have any calix; the corolla of each consists of six petals, and they have each six stamina; the hermaphrodite has three pistilli, and three capsules containing many seeds. There are three species, none of them natives of Britain.

VERB, in grammar. See GRAMMAR, p. 734.

VERBAL, something that belongs to verbs, or even to words of any kind spoken with the mouth.

VERBAL *Agreement*, in Scots law. See LAW, Tit. xxi. 1, *&c.*

VERBASCUM, in botany, a genus of the pentandria monogynia class. The corolla is rotated, and somewhat unequal; and the capsule has two cells, and two valves. There are twelve species, four of them natives of Britain, *viz.* the thapsus, or great white mullein, the leaves of which are emollient; the lychnitis, or hoary mullein; the nigrum, or black mullein; and the blattoria, or yellow moth-mullein.

VERBENA, in botany, a genus of the diandria monogynia class. The corolla is funnel-shaped, and crooked; one tooth of the calix is truncated; and it has two or four

four naked feeds. There are 16 fpecies, only one of them, *viz.* the officinalis, or vervain, a native of Britain.

VERBERATION, in phyfics, a term ufed to exprefs the caufe of found, which arifes from a verberation of the air, when ftruck in divers manners by the feveral parts of the fonorous body firft put into a vibratory motion.

VERBESINA, in botany, a genus of the fyngenefia polygamia fuperflua clafs. The receptacle is paleaceous; the pappus is furnifhed with an awn; the calix is double; and it has about five flofcules in the radius. There are 13 fpecies, none of them natives of Britain.

VERD, or CAPE-VERD, a promontory of Africa, forty miles north-weft of the mouth of the river Gambia: W. long. 18°, N. lat. 15°.

There are a number of iflands in the Atlantic ocean, called Cape-Verd iflands, from their being fituated off this cape.

VERDIGREASE, a kind of ruft of copper, much ufed by painters as a green colour.

Verdigreafe is properly no other than copper diffolved by a mild acid into the form of an ærugo, or ruft.

This ruft of copper is rarely ufed internally; nor ought it, unlefs in the moft defperate cafe, where inftantaneous vomiting is neceffary. Externally it is much ufed as a detergent or deficcative: it eats off fungous flefh in ulcers, and, mixed with honey, is ufed in aphthæ and ulcerations of the mouth.

VERDICT, is the anfwer of the jury given to the court, concerning the matter of fact, in any cafe civil or criminal, committed by the court to their trial and examination.

VERDITER, or VERDETER, a kind of mineral fubftance, fometimes ufed by the painters, *&c.* for a blue; but more ufually mixed with a yellow for a green colour.

VERDOY, in heraldry, denotes a bordure of a coat of arms, charged with any kinds or parts of flowers, fruits, feeds, plants, *&c.*

VERGETTE, in heraldry, denotes a pallet, or fmall pale; and hence, a fhield divided by fuch pallets is termed vergette. See PALE.

VERIFICATION, in general, is the act of proving a thing; but among the French, it only fignifies the recording of the king's edicts by the parliament.

VERJUICE, a liquor obtained from grapes or apples, unfit for wine or cyder; or from fweet ones, whilft yet acid and unripe. Its chief ufe is in fauces, ragouts, *&c.* though it is alfo an ingredient in fome medicinal compofitions, and is ufed by the wax-chandlers to purify their wax.

VERMICELLI, a compofition of flour, cheefe, yolks of eggs, fugar, and faffron, reduced to a pafte, and formed into long flender pieces like worms, by forcing it with a pifton through a number of little holes.

It was firft brought from Italy, where it is in great vogue: it is chiefly ufed in foups and pottages, to provoke venery, *&c.*

VERMICULAR, an epithet given to any thing that bears a relation or refemblance to worms.

VERMIFORMIS, in anatomy, a term applied to various parts in the human body, bearing fome refemblance to worms.

VERMILION, a very bright and beautiful red colour, in great efteem among the ancients, under the name of minium. There are two kinds of it, the one natural, the other factitious. The natural is found in fome filver mines, in the form of a ruddy fand, which is afterwards prepared and purified by feveral lotions and coctions. The artificial is made of mineral cinnabar, ground up with aqua-vitæ and urine, and afterwards dried.

It is alfo made of lead burnt and wafhed, or of cerufs prepared by fire: but this is not properly called vermilion, but minium, or red-lead.

VERMIN, a collective name including all kinds of little animals, or infects, which are hurtful or troublefome to men, beafts, fruits, *&c.* as worms, lice, fleas, caterpillars, ants, flies, *&c.*

VERNACULAR, is applied to any thing that is peculiar to fome one country.

VERNAL, fomething belonging to the fpring feafon.

VERONA, a city of Italy, in the territory of Venice, capital of the Veronefe, fituated on the Adige: E. long. 11° 15′, N. lat. 45° 20′.

VERONICA, in botany, a genus of the diandria monogynia clafs. The corolla is rotated, and confifts of four fegments, the loweft one being lefs than all the reft; and the capfule has two cells. There are 34 fpecies, 13 of them natives of Britain.

VERSAILLES, a town of France, in the province of the ifle of France, fituated eleven miles weft of Paris, where ftands one of the moft elegant and magnificent palaces in the world, built by Lewis XIV.

VERSE, in poetry, a line or part of a difcourfe, confifting of a number of long and fhort fyllables, which run with an agreeable cadence, the like being alfo reiterated in the courfe of the piece.

VERSE, is alfo ufed for a part of a chapter, fection, or paragraph, fubdivided into feveral little articles.

VERSIFICATION, the art or manner of making verfe; alfo the tune and cadence of verfe.

Verfification is properly applied to what the poet does more by labour, art, and rule, than by invention.

VERSION, a tranflation of fome book or writing, out of one language into another.

VERT, in heraldry, the term for a green colour. It is called vert in the blazon of the coats of all under the degree of nobles; but in coats of nobility, it is called emerald; and in thofe of kings, venus. In engraving, it is expreffed by diagonals, or lines drawn athwart from right to left, from the dexter chief corner to the finifter bafe, as reprefented in Plate CXLVII. fig. 23.

VERTEBRÆ, in anatomy. See ANATOMY, p. 166.

VERTEX, in anatomy, denotes the crown of the head.

Hence vertex is alfo ufed figuratively, for the top of other things: thus, the vertex of a cone, pyramid, *&c.* is the top of any one of thefe figures.

VERTEX is alfo ufed in aftronomy, for the point of heaven perpendicularly over our heads, properly called the zenith.

VERTICILLATE PLANTS. See BOTANY p. 637.

VERTICITY, is that property of the loadftone, whereby it turns, or directs itfelf to fome peculiar point.

VETIGO, in medicine. See MEDICINE, p. 146.

VERVAIN, in botany. See VERBENA.

VERU-MONTANUM, in anatomy. See ANATOMY, p. 273.

VESICA, in anatomy. See ANATOMY, p. 269.

VESICATORIUM, an external medicine, ferving to raife a blifter; whence alfo it is itfelf, though improperly, called a blifter

We have veficatories made of cantharides, euphorbium, figs, fublimate of mercury, lapis infernalis, muftard, anacardium, fquills, briony, vinegar, pepper, leaven, *&c.*

VESICULA, a diminutive of vefica, fignifying a little bladder.

VESPA, the WASP, in zoology, a genus of infects belonging to the order of hymenoptera. The mouth confifts of two jaws without any probofcis; the fuperior wings are plaited; there is a fharp fting in the tail; and the eyes are lunar. There are 28 fpecies. The common wafps live in focieties like the bee. See APIS.

VESPERS, in the church of Rome, denote the afternoon fervice; anfwering, in fome meafure, to the evening-prayers of the church of England.

VESPERTILIO, the BAT, in zoology, a genus of quadrupeds belonging to the order of primates. All the the teeth are erect, pointed, near each other, and the firft four are equal; the fore-feet have the toes connected by a membrane expanded into a kind of wings, by which the creature is enabled to fly. They fly about in the night, and feed upon moths.

VESPERTILIONUM ALÆ, in anatomy. See ANATOMY, p. 275.

VESSEL, denotes in general any thing for holding liquors; fuch are our domeftic cups, pots, *&c.* as alfo the retorts, matraffes, crucibles, *&c.* For the theory and conftruction of chemical veffels, fee CHEMISTRY, p. 108.

In anatomy, all the parts which contain or convey a fluid are called veffels; as the veins, arteries, lymphatics.

VESSEL, in navigation, a general name for all forts of fhips. See SHIP.

VESTALIA, in Roman antiquity, a feftival celebrated in honour of the goddefs Vefta, on the fifth of the ides of June; that is, on the ninth of that month.

VESTALS, among the ancient Romans, were priefteffes of the goddefs Vefta, and had the perpetual fire committed to their charge: they were at firft only four in number, but afterwards increafed to fix; and it does not appear that their number ever exceeded fix, among whom one was fuperior to the reft, and called *veftalis maxima.*

The veftals were chofen from fix to ten years of age, and obliged to ftrict continuency for thirty years; the firft ten of which were employed in learning the ceremonies of religion, the next ten in the performance of them, and the ten laft in teaching them to the younger veftals.

The habit of the veftals confifted of an head-drefs, called infula, which fat clofe to their heads, and from whence hung certain laces called vittæ; a kind of furplice made of white linen, and over it a purple mantle with a long train to it.

VESTIBLE, in architecture, a kind of entrance into a large building; being an open place before the hall, or at the bottom of the ftair-cafe.

VESTIBLE *of the ear*, in anatomy. See ANATOMY, p. 297.

VESTRY, a place adjoining to a church, where the veftments of the minifter are kept; and alfo a meeting at fuch place, confifting of the minifter, church-wardens, and chief men of moft parifhes, who make a parifh veftry or meeting. By cuftom there are felect veftries, being a certain number of perfons chofen to have the government of the parifh, make rates, and take the accounts of church-wardens, *&c.*

VESUVIUS, a famous volcano, or burning mountain, fituated only fix miles eaft of the city of Naples, in Italy. See VOLCANO.

VETCH, in botany. See VICIA.

VETERAN, among the ancient Romans, an appellation given to a foldier who was grown old in the fervice, or had made a certain number of campaigns.

VIALES, in mythology, a name given among the Romans to the gods who had the care and guard of the roads and high-ways.

VIATICUM, in the church of Rome, an appellation given to the eucharift when adminiftered to perfons at the point of death.

VIATOR, in Roman antiquity, an appellation given in common to all officers of any of the magiftrates; as lictors, accenfi, fcribes, criers, *&c.*

VIBEX, is fometimes ufed, by phyficians, for a black and blue fpot in the fkin, occafioned by an afflux or extravafation of blood.

VIBRATION, in mechanics, a regular, reciprocal motion of a body, as a pendulum, *&c.*

VIBURNUM, in botany, a genus of the pentandria trigynia clafs. The calix is above the fruit, and confifts of five fegments; the corolla has likewife five fegments, and the berry contains one feed. There are nine fpecies, two of them natives of Britain, *viz.* the lantana, or way-faring tree; and the opulus, or water-elder.

VICAR, a perfon appointed, as deputy to another, to perform his functions in his abfence, and under his authority.

VICAR, in the canon law, denotes a prieft of a parifh, the predial tithes whereof are impropriated or appropriated; that is, belong either to a chapter, religious houfe, *&c.* or to a layman, who receives them, and only allows the vicar the fmall tithes, or a convenient falary.

VICE, in ethics, is ordinarily defined an elective habit, deviating, either in excefs, or defect, from the juft medium wherein virtue is placed.

VICE, in fmithery, and other arts employed in metals, is a machine, or inftrument, ferving to hold faft any thing they are at work upon, whether it is to be filed, bent, rivetted, *&c.*

VICE is alfo ufed, in the compofition of divers words, to denote the relation of fomething that comes inftead, or in the place, of another; as vice-admiral, vice-chancellor, vice chamberlain, vice-prefident, *&c.* are officers who take place in the abfence of admirals, *&c.*

VICE-ROY, a governor of a kingdom, who commands in the name and ftead of a king, with full and fovereign authority. See KING.

VICIA, in botany, a genus of the diadelphia decandria clafs. The under fide of the ftigma is tranfverfely bearded. There are 18 fpecies, fix of them natives of Britain, *viz.* the eracca, or tufted wood-vetch; the fepium, or bufh-vetch; the fativa, or common vetch; the lathyroides, or wild-vetch; and the lutea, or yellow vetch.

VICISSITUDE, the regular fucceffion of one thing after another; as the viciffitude of day and night, of the feafons, *&c.*

VISCOUNT, a degree of nobility next below a count, or earl, and above a baron.

VICTIM, denotes a bloody facrifice, offered to fome deity, of

of a living creature, as a man or beast, which is slain to appease his wrath, or obtain some favour.

VICTIMARIUS, in antiquity, a minister or servant of the priest, whose office was to bind the victims, and prepare the water, knife, and other things necessary for the sacrifice.

VICTORY, the overthrow or defeat of an enemy, in war or combat.

VICTUALLING-OFFICE, an office kept on Tower-hill, London, for the furnishing his majesty's navy with victuals.

VICTUALS, signifies any sustenance, or things necessary to live upon, as meat and provisions.

VIENNA, the capital city of the circle of Austria and of the German empire, is situated on the Danube, in E. long. 16° 21′, and N. lat 48° 20′.

Vienna is an archbishop's see, and has a celebrated university.

VIGILS, in church-history, are the fasts appointed before certain festivals, in order to prepare the mind for a due observation of the ensuing solemnity.

VIGO, a port-town of Galicia, in Spain, 70 miles south-east of Cape Finisterre: W. long. 9° 18′, N. lat. 42° 15′.

VILLA FRANCA, the name of several towns, one in Piedmont, three miles east of Nice; another of Catalonia, eighteen miles west of Barcelona; a third, the capital of St Michael, one of the Azores; and a fourth, a town of Estremadura, in Spain, fifty-four miles south-east of Salamanca.

VILLA FRANCHE, a town of Orleanois, in France, twelve miles north of Lyons.

VILLAGE, an assemblage of houses, inhabited chiefly by peasants and farmers, and having no market, whereby it is distinguished from a town.

VILLAIN, or VILLEIN, in our ancient customs, denotes a man of servile and base condition, *viz.* a bondman or servant.

VILLA REAL, the name of two towns; the one in Spain, thirty miles north of Valencia; and the other in Portugal, fifty miles east of Porto.

VILLA RICA, a port-town of Mexico, situated on the gulph of Mexico, in W long. 100°, and N. lat. 20°.

VILLENAGE, a kind of ancient tenure, whereby the tenant was bound to do such services as the lord commanded, or such as were fit for villains or bondmen to perform.

VILLI, among botanists, a kind of down, like coarse hair, with which some trees abound.

VILLOSE, or VILLOUS, something abounding with villi, or fibres like coarse hairs: such is one of the coats of the stomach.

VINALIA, in Roman antiquity, a festival on the ninth of the kalends of May, in honour both of Jupiter and Venus.

VINCA, in botany, a genus of the pentandria monogynia class. It has two erect follicles; the seeds are plumose; and the tube of the corolla terminates in a lacerated corona. There are four species, two of them natives of Britain, *viz.* the minor, or periwinkle; and major, or greater periwinkle.

Cape VINCENT, the most south-west promontory of Portugal: W. long. 10°, and N. lat 36° 55′.

St VINCENT, one of the Caribbee islands, seventy-five miles west of Barbadoes.

St VINCENT, is also a province of Brazil, bounded by the Rio Janiero on the north, by the Atlantic on the east, by the province of del Rey on the south, and by that of the Spanish La Plata on the west.

VINDEMIATING, the gathering of the grapes, or other ripe fruits, as apples, pears, cherries, *&c.*

VINDEMIATRIX, or VINDEMIATOR, a fixed star of the third magnitude in the constellation virgo.

VINE. See VITIS.

VINEGAR, an acid penetrating liquor, prepared from wine, cyder, beer, *&c.* of considerable use both as a medicine and sauce. See CHEMISTRY, p. 97, 166.

VINEYARD, a plantation of vines.

The best situation of a vineyard is on the declivity of an hill, lying on the south.

VINOUS, something that relates to wine, or that has the taste and smell thereof. See WINE.

VINTAGE, a crop of wine, or what is got from the vines each season.

VINUM, a liquor or drink commonly called wine. See WINE.

VIOL, a musical instrument of the same form with the violin, and struck like that with a bow.

VIOLA, in botany, a genus of the syngenesia monogynia class. The calix consists of five leaves, and the corolla of five irregular petals horned behind; the capsule has three valves, and one cell. There are 24 species, seven of them natives of Britain.

VIOLATION, the act of violating, that is, forcing a woman, or committing a rape upon her.

This term is also used in a moral sense, for a breach or infringement of a law, ordinance, or the like.

VIOLENT, in the schools, a thing done by force; in which sense it stands opposed to spontaneous.

VIOLENT *Profits*, in Scots law. See LAW, Tit. xiii. 20.

VIOLET, in botany. See VIOLA.

VIOLIN, or FIDDLE, a musical instrument mounted with four strings, or guts, and struck, or played, with a bow.

VIOLONCELLO, of the Italians is properly our fifth violin; which is a little bass-violin, half the size of the common bass-violin, and its strings just half as thick and half as long, which renders the sound just an octave higher than the same.

VIOLONE in musick, a double bass, almost twice as big as the common bass-violin, and the strings bigger and longer in proportion, and consequently its sound an octave lower than that of our bass-violin, which has a noble effect in great concerts

VIPER, in zoology. See COLUBER.

VIRAGO, a woman of extraordinary stature and courage; and who, with the female sex, has the mien and air of a man, and performs the actions and exercises of men.

VIRGA AUREA, in botany. See SOLIDAGO.

VIRGA SANGUINEA, in botany. See CORNUS.

VIRGIN, a female who has had no carnal commerce with man.

VIRGIN is also applied figuratively to several things that retain their absolute purity, and have never been made use of.

VIRGIN-ISLANDS, very small islands of the Caribbees, situated in the Atlantic or American-ocean, a little to the eastward of Porto-Rico.

VIRGINIA, one of the British American colonies, situated between seventy-four and eighty degrees west long. and between thirty-six and thirty nine degrees of north lat.

lat. bounded by the river Patowmack, which ſeparates it from Maryland, on the north; by the Atlantic-ocean, on the eaſt; by Carolina, on the ſouth; and may be extended as far weſtward as we think fit.

VIRGINITY, the teſt or criterion of a virgin, or that which intitles her to the denomination.

VIRGO, in aſtronomy, one of the ſigns or conſtellations of the zodiac. See ASTRONOMY, p. 487.

VIRILE, ſomething that belongs or is peculiar to a man, or the male ſex.

VIRTUAL, or POTENTIAL, ſomething that has a power or virtue of acting or doing. The term is chiefly underſtood of ſomething that acts by a ſecret inviſible cauſe, in oppoſition to actual and ſenſible.

VIRTUE, a term uſed in various ſignifications. In the general it denotes power, or perfection of any thing, whether natural or ſupernatural, animate or inanimate, eſſential or acceſſory. But in its more proper or reſtrained ſenſe, virtue ſignifies an habit, which improves and perfects the poſſeſſor and his actions.

VIRTUOSO, an Italian term, lately introduced into Engliſh, ſignifying a man of curioſity and learning, or one who loves and promotes the arts and ſciences: but among us the term ſeems to be appropriated to thoſe who apply themſelves to ſome curious and quaint, rather than immediately uſeful, art or ſtudy, as antiquaries, collectors of rarities of any kind, microſcopical obſervers, *&c.*

VIRULENT, a term applied to any thing that yields a virus, that is, a contagious or malignant pus.

VISCERA, in anatomy, a term ſignifying the ſame with entrails, including the heart, liver, lungs, ſpleen, inteſtines, and other inward parts of the body. See ANATOMY, Part VI.

VISCIDITY, or VISCOSITY, the quality of ſomething that is viſcid or viſcous, that is, glutinous and ſticky, like bird-lime, which the Latins call by the name *viſcus.*

VISCUM, in botany, a genus of the diœcia tetrandria claſs. The calix of both male and female conſiſts of four ſegments; neither of them have any corolla; there are no filaments in the male, the antheræ being connected to the calix; the female has no ſtylus; and the berry contains one heart-ſhaped ſeed. There are ſix ſpecies, none of them natives of Britain.

VISIBLE, ſomething that is an object of ſight or viſion, or ſomething whereby the eye is affected, ſo as to produce a ſenſation.

VISIER, an officer or dignitary in the Ottoman empire, whereof there are two kinds; the firſt, called by the Turks viſier-azem, that is, grand viſier, is the prime miniſter of ſtate of the whole empire. He commands the army in chief, and preſides in the divan or great council. Next to him are ſix other ſubordinate viſiers, called viſiers of the bench, who officiate as his counſellors, or aſſeſſors in the divan.

VISION, in optics, the act of ſeeing or perceiving external objects, by means of the organ of ſight, the eye. See ANATOMY, p. 289. and OPTICS.

VISTULA, or WEISEL, a large river of Poland, which, taking its riſe in the mountains ſouth of Sileſia, viſits Cracow, Warſaw, *&c.* and continuing its courſe north, falls into the Baltic ſea below Dantzick.

VISUAL, in general, ſomething belonging to viſion.

VITAL, in phyſiology, an appellation given to whatever miniſters principally to the conſtituting or maintaining of life in the bodies of animals: thus, the heart, lungs, and brain are called vital parts; and thoſe operations of theſe parts, whereby the life of animals is maintained, are called vital functions.

VITEX, in botany, a genus of the didynamia angioſpermia claſs. The corolla conſiſts of ſix ſegments, and the calix of five teeth; and the berry contains four ſeeds. There are four ſpecies, none of them natives of Britain.

VITIS, the VINE, in botany, a genus of the pentandria monogynia claſs. The petals adhere at the apex; and the berry contains five ſeeds. There are ſeven ſpecies, none of them natives of Britain.

VITIS IDÆA, in botany. See VACCINIUM.

VITIOUS INTROMISSION, in Scots law. See LAW, Tit. xxviii. 20.

VITREOUS *Humour of the Eye.* See ANATOMY, p. 289.

VITRIFICATION, in chemiſtry, is the converting a body into glaſs, by means of fire.

VITRIOL, a compound body formed of the particles of metals diſſolved by the acid of ſulphur, and that either by the operations of nature within the earth, or in the chemiſts elaboratory by proper admixtures and aſſiſtances, and afterwards, by the help of water, brought into the form of a ſalt. See CHEMISTRY, p. 81, 132.

VITRIOLATED, among chemiſts, ſomething that has vitriol infuſed in it.

VITRIOLIC, an appellation given to whatever abounds with, or partakes of, the nature of vitriol: thus ſuch foſſil bodies as contain vitriol, are called vitriolic minerals, or ores of vitriol.

VITTA, in anatomy, that part of the amnios which ſticks to an infant's head when juſt born.

VITUS's DANCE. See MEDICINE, p. 99.

VIVERRA, in zoology, a genus of quadrupeds belonging to the order of feræ. They have ſix fore-teeth, the intermediate ones being ſhorter, and more than three grinders; and the claws are exſerted. There are ſix ſpecies, *viz.* 1. The ichneumon, with the tail tapering towards the point, and the toes diſtant from each other. It is a native of Egypt and India, where it is tamed, and follows its maſter like a dog. It feeds upon lizards, frogs, *&c.* and is particularly an enemy to ſerpents. 2. The naſua, is reddiſh, with white rings on the tail. It is a native of America, and digs the ground in ſearch of worms; it feeds likewiſe upon mice, and fruits; when enraged, it ſends forth an abominable ſtench. 3. The narica is of a duſky colour; it is likewiſe a native of America. 4. The putorius varies in colour, but has generally four white parallel lines on the back. It is a native of North America, is ſlow in its motion, and emits its urine, attended with a moſt diſagreeable ſmell, when enraged. 5. The zibetha, has an annulated tail, and the back is ſtreaked with waves of black and aſh-colour. It is a native of China, and Mexico. It is a fierce and ungovernable animal, and erects the hairs of its back when angry. 6. The genetta has an annulated tail, and the body is ſpotted with a dirty yellow and black colour. It is a native of the Eaſt, and ſmells of muſk.

VIVIPAROUS, in natural hiſtory, an epithet applied to ſuch animals as bring forth their young alive and perfect; in contradiſtinction to them that lay eggs, which are called oviparous animals.

UKRAIN, a province of Muſcovy, lying northwards of Little Tartary, ſo called as being a frontier againſt Turky.

ULADISLAW, a city of Great Poland, ſituated on the river Boriſthenes, eighty-miles north-weſt of Warſaw: E. long. 19°, and N. lat. 53°.

ULCER, in ſurgery. See SURGERY, p. 646.

ULCERATION, in ſurgery, a little hole in the ſkin, cauſed by an ulcer.

ULEX, in botany, a genus of the diadelphia decandria claſs. The calix conſiſts of two leaves; and the pod is about the length of the calix. There are two ſpecies, one of them, *viz.* the europæus, or furze, a native of Britain.

ULIGINOUS, in agriculture, an appellation given to a moiſt, mooriſh, and fenny ſoil.

ULLAGE, in gauging, is ſo much of a caſk or other veſſel, as it wants of being full.

ULM, an imperial city of Swabia, in Germany, ninety miles ſouth-weſt of Ratiſbon: E. long. 10°, N. lat. 48° 24′.

ULMARIA, in botany. See FILIPENDULA.

ULMUS, in botany, a genus of the pentandria digynia claſs. The calix conſiſts of five ſegments; it has no corolla; and the berry is dry, compreſſed, and membranaceous. There are three ſpecies, two of them natives of Britain, *viz.* the campeſtris, or common elm; and the glabra, or broad-leaved elm.

ULNA, in anatomy. See ANATOMY, p. 178.

ULNARIS, in anatomy. See ANATOMY, p. 199.

ULSTER, the moſt northern province of Ireland, the chief town of which is Londonderry.

ULTERIOR, in geography, is applied to ſome part of a country or province, which, with regard to the reſt of that country, is ſituated on the farther ſide of the river, mountain, or other boundary, which divides the country into two parts.

ULTIMUS HÆRES, in Scots law. See LAW, Tit. xxix. 1, 2.

ULTRAMARINE, a beautiful blue colour uſed by the painters, prepared from lapis lazuli by calcination.

ULTRAMONTANE, ſomething beyond the mountains. The term is principally uſed in relation to Italy and France, which are ſeparated by the mountains of the Alps.

ULVA, in botany, a genus of the cryptogamia algæ claſs, conſiſting of a merely foliaceous ſubſtance, formed into long cylindrical tubes. There are 10 ſpecies, all natives of Britain.

ULULA, in ornithology. See STRIX.

UMBELLÆ. See BOTANY, p. 637.

UMBELLIFEROUS PLANTS, are ſuch as have their tops branched and ſpread out like an umbrella.

UMBILICAL, among anatomiſts, ſomething relating to the umbilicus or navel.

UMBILICUS, the NAVEL, in anatomy. See ANATOMY, p. 257. and MIDWIFERY.

UMBONE, a name uſed by ſome for the ſtyle or piſtil of a flower.

UMPIRE, a third perſon choſen to decide a controverſy left to arbitration.

UNCIA, in general, a Latin term denoting the twelfth part of any thing; particularly the twelfth part of a pound, called in Engliſh an ounce; or the twelfth part of a foot, called an inch.

UNCTION, the act of anointing or rubbing with oil or other fatty matter.

UNCTION, in matters of religion, is uſed for the character conferred on ſacred things, by anointing them with oil. Unctions were very frequent among the Hebrews. They anointed both their kings and high-prieſts at the ceremony of their inauguration. They alſo anointed the ſacred veſſels of the tabernacle and temple, to ſanctify and conſecrate them to the ſervice of God. The unction of kings is ſuppoſed to be a ceremony introduced very late among the Chriſtian princes. It is ſaid, that none of the emperors were ever anointed before Juſtinian, or Juſtin. The emperors of Germany took the practice from thoſe of the eaſtern empire: king Pepin of France was the firſt who received the unction. In the ancient Chriſtian church, unction always accompanied the ceremonies of baptiſm and confirmation. Extreme unction, or the anointing perſons in the article of death, was alſo practiſed by the ancient Chriſtians, in compliance with the precept of St James, chap. v. 14 and 15 verſes; and this extreme unction the Romiſh church has advanced to the dignity of a ſacrament. In is adminiſtred to none but ſuch as are afflicted with ſome mortal diſeaſe, or are in a decrepit age. It is refuſed to impenitent perſons, as alſo to criminals. The parts to be anointed are the eyes, the ears, the noſtrils, the mouth, the hands, the feet, and the reins. The laity are anointed in the palms of the hands, but prieſts on the back of it; becauſe the palms of their hands have been already conſecrated by ordination. The parts abovementioned are anointed in the form of a croſs. The prieſt begins anointing the ſick perſon's eyes, ſaying, "May God, by his holy anointing, pardon you the ſins you have committed by the eyes." In like manner he proceeds to the other parts, varying the words according to the parts he anoints.

UNDECAGON, is a regular polygon, of eleven ſides.

UNDECEMVIR, a magiſtrate among the ancient Athenians, who had ten other collegues or aſſociates joined with him in the ſame commiſſion. The function of the undecemviri at Athens were much the ſame as thoſe of the prevots de marechauſſe in France: they took care of the apprehending of criminals, ſecured them in the hands of juſtice, and when they were condemned, took them again into cuſtody, that the ſentence might be executed on them. They were choſen by the tribes, each tribe naming its own; and as the number of the tribes after Calliſthenes was but ten, which made ten members, a ſcribe or notary was added, which made the number eleven.

UNDER *the ſea*, in the ſea-language. A ſhip is ſaid to be ſo when ſhe lies ſtill, or waits for ſome other ſhips, with her helm laſhed, or tied up a-lee.

UNDERSTANDING. See METAPHYSICS, and LOGIC.

UNDERWALD, a canton of Switzerland, bounded by Switz and Lucern on the north, by Uri on the eaſt, and by another part of Lucern on the weſt; being about 25 miles long, and as many broad.

UNDERWOOD, is coppice, or any wood that is not accounted timber.

UNDULA-

UNDULATION, in physics, a kind of tremulous motion or vibration observable in a liquid, whereby it alternately rises and falls like the waves of the sea.

This undulatory motion, if the liquid be smooth and at rest, is propagated in concentric circles, as most people have observed upon throwing a stone or other matter upon the surface of a stagnant water, or even upon touching the surface of the water lightly with the finger or the like. The reason of these circular indulations is, that by touching the surface with your finger, there is produced a depression of the water in the place of contact. By this depression the subjacent parts are moved successively out of their place, and the other adjacent parts thrust upwards, which lying successively on the descending liquid, follow it; and thus the parts of the liquid are alternately raised and depressed, and that circularly. When a stone is thrown into the liquid, the reciprocal vibrations are more conspicuous.

Undulatory motion is likewise applied to a motion in the air, whereby its parts are agitated after the like manner as waves in the sea; as is supposed to be the case when the string of a musical instrument is struck. This undulatory motion of the air, is supposed the matter or cause of sound.

UNGUENT, in medicine and surgery, a topical remedy or composition, chiefly used in the dressing of wounds and ulcers.

UNGUIS, in anatomy. See ANATOMY, p. 160.

UNGUIS, among botanists. See BOTANY, p. 637.

UNGULA, in geometry, the section of a cylinder cut off by a plane passing obliquely through the plane of the base and part of the cylindric surface.

UNGULA, in natural history, the claw or hoof of a quadruped.

UNICORN, an animal famous among the ancients, but looked on by the moderns as fabulous.

UNICORN-FISH, in ichthyology. See MONODON.

UNIFORM denotes a thing to be similar, or consistent, either with another thing or with itself, in respect of figure, structure, proportion, and the like; in which sense it stands opposed to difform.

UNIFORMITY, a similitude, or resemblance, between the parts of a whole: such is that we meet with in figures of many sides, and angles respectively equal, and answerable to each other.

UNIOLA, in botany, a genus of the triandria digynia class. The calix consists of many valves; and the spica is oval and carinated. There are four species, none of them natives of Britain.

UNION, a junction, coalition, or assemblage of two or more different things in one.

UNION OF LANDS, in Scots law. See LAW, Tit x. 20.

UNION, or the UNION, by way of eminence, is more particularly used to express the act whereby the two separate kingdoms of England and Scotland were incorporated into one, under the title of The kingdom of Great-Britain. This happy union, in vain attempted by king James I. was at length effected in the year 1707, by the general consent of the queen and the estates of each realm. The chief articles of this union are, That the two kingdoms shall be united into one kingdom, by the name of Great-Britain: that they, in consequence thereof, be represented by one parliament, of which sixteen peers and forty-five commoners are to be elected for Scotland, and have the same privileges with those of England: that the subjects of either nation shall have equal freedom of trade, and be liable to the same custom, and the like laws for public government, *&c.* The kirk or church of Scotland is confirmed; and the courts of justice are to remain the same as they were before the union, yet subject to regulation, *&c.* A court of exchequer is also erected in Scotland, to be a court of record, revenue, and judicature, for ever; and barons of the said court are appointed, who shall be the judges there.

UNISON, in musick, the effect of two sounds which are equal in degree of tune, or in point of gravity and acuteness.

UNIT, or UNITY, in arithmetick, the number one, or one single individual part of discrete quantity.

UNITED NETHERLANDS consist of the provinces of Holland, Zealand, Friesland Groningen, Overyssel, Gelderland, with Zutphen and Utrecht; these are bounded by the German sea on the north and west; by the circle of Westphalia, on the east; and by Flanders, Brabant, and the duchy of Cleves, on the south: lying between 3° 20′ and 7° 30′ east longitude, and between 51° 35′ and 52° 40′ north latitude; being about fifty miles long, and as many bread including the Zuyder-sea, which takes up a considerable space between these limits.

UNITY, in poetry. In the drama there are three unities to be observed, *viz.* the unity of action, that of time, and that of place. In the epic poem, the great, and almost only unity, is that of the action. Some regard indeed ought to be had to that of time; that of place there is no room for. The unity of character is not reckoned among the unities. See COMPOSITION.

UNIVERSAL, something that is common to many things, or it is one thing belonging to many or all things.

UNIVERSE, a collective name, signifying the whole world, or the assemblage of heaven and earth, with all things therein. See ASTRONOMY, and GEOGRAPHY.

UNIVERSITY, a collective term, applied to an assemblage of several colleges, established in a city, wherein are professors in the several sciences, appointed to teach them to students, and where degrees or certificates of study in the divers faculties are taken up.

In each university four faculties are usually taught, theology, medicine, law, and the arts and sciences.

They are called universities, or universal schools, by reason the four faculties are supposed to take in the whole compass of study.

Universities had their first rise in the XIIth and XIIIth centuries. Those of Paris and Bologna pretend to be the first that were set on foot; but they were on a different footing from the universities among us.

The universities of Oxford and Cambridge seem entitled to greatest antiquity of any in the world; and Baliol and Merton colleges in Oxford, and St Peter's in Cambridge, all made colleges in the XIIIth century, may be said to be the first regular endowments of this kind in Europe.

The universities of Scotland are four, *viz.* those of St. Andrews, Aberdeen, Edinburgh, and Glasgow. See EDINBURGH, *&c.*

UNIVOCAL, in the schools, is applied to two or more names, or terms that have but one signification; in opposition to equivocal,

equivocal, which is where one term has two or more ſignifications.

UNLAWFUL, illegal, ſomething prohibited by, or contrary to the terms of law, either divine or human.

UNMOOR, a term uſed at ſea. When a veſſel which was riding at anchor, weighs the ſame, or gets it up, in order to ſail, they ſay ſhe is unmooring.

VOCABULARY, in grammar, denotes the collection of the words of a language, with their ſignifications, otherwiſe called a dictionary, lexicon, or nomenclature. See DICTIONARY.

A vocabulary is properly a leſſer kind of dictionary, which does not enter ſo minutely into the origins and different acceptations of words.

VOCAL, ſomething that relates to the voice or ſpeech: thus vocal muſick is that ſet to words, eſpecially verſes, and to be performed by the voice; in contradiſtinction to inſtrumental muſick, compoſed only for inſtruments, without ſinging.

VOCATIVE, in grammar, the fifth ſtate or caſe of nouns.

When we name the perſon we are ſpeaking to, or addreſs ourſelves to the thing we are ſpeaking of, as if it were a perſon, the noun or name requires a new relation, which the Latins and Greeks expreſs by a new termination, called the vocative; as, from *dominus, a lord*, is formed the vocative *domine, O lord*.

VOICE, a ſound produced in the throat and mouth of an animal, by an aparatus of inſtruments for that purpoſe.

Voices are either articulate or inarticulate. Articulate voices are thoſe whereof ſeveral conſpire together to form ſome aſſemblage or little ſyſtem of ſounds; ſuch are the voices expreſſing the letters of an alphabet, numbers of which joined together form words. Inarticulate voices are ſuch as are not organized, or aſſembled into words; ſuch is the barking of dogs, the braying of aſſes, the hiſſing of ſerpents, the ſinging of birds, *&c.*

The formation of the human voice, with all the varieties thereof obſerved in ſpeech, muſick, *&c.* makes a very curious article of inquiry; and the apparatus and organiſm of the parts adminiſtring thereto, is ſomething exceedingly ſurpriſing. Thoſe parts are the trachea or wind-pipe, through which the air paſſes and repaſſes into the lungs; the larynx, which is a ſhort cylindric canal at the head of the trachea; and the glottis, which is a little oval cleft or chink left between two ſemicircular membranes ſtretched horizontally withinſide the larynx; which membranes, though capable of joining cloſe together, do generally leave an interval either greater or leſs between them called the glottis. A particulr deſcription of each part may be ſeen in Anatomy, Part IV.

VOICE, in grammar, a circumſtance in verbs, whereby they come to be conſidered as either active or paſſive; *i. e.* either expreſſing an action impreſſed on another ſubject, as, *I beat;* or receiving it from another, as *I am beaten.* See GRAMMAR, p. 738.

VOICE, in matters of election, denotes a vote or ſuffrage.

VOIDED, in heraldry, is underſtood of an ordinary whoſe inner or middle part is cut out, leaving nothing but its edges to ſhew its form, ſo that the field appears through it. Hence it is needleſs to expreſs the colour or metal of the voided part, becauſe it muſt of courſe be that of the field.

VOIDER, in heraldry, one of the ordinaries whoſe figure is much like that of a flaſk or flaunch, only that it doth not bend ſo much. See Plate CXLVII. fig. 24.

VOL, among heralds, ſignifies the two wings of a fowl joined together, borne in armory, as being the whole that makes the flight. Accordingly, a demi-vol is a ſingle wing.

VOLA, the palm or inſide of the hand, comprehended between the fingers and the wriſt.

VOLANT, in heraldry, is when a bird in a coat of arms is drawn flying, or having its wings ſpread out.

VOLATILE, in phyſics, is commonly uſed to denote a mixed body whoſe integral parts are eaſily diſſipated by fire or heat; but is more properly uſed for bodies whoſe elements or firſt component parts are eaſily ſeparated from each other, and diſperſed in air. See CHEMISTRY.

VOLATILISATION, the act of rendering fixed bodies volatile, or of reſolving them by fire into a fine ſubtle vapour or ſpirit, which eaſily diſſipates and flies away. All bodies, even the moſt fixed, as gold, may be volatilized; either of themſelves, or with the admixture of ſome volatile ſubſtance, or ſpirit, by diſtillation or ſublimation

VOLERY, a great bird-cage, ſo large that the birds have room to fly up and down in it.

VOLHINIA, or VOLONIA a province of Poland, bounded by Poleſia, on the north; by the lower Volhinia, or Ukrain, in the territories of Ruſſia, on the eaſt; by Podolia, on the ſouth; and by the province of Red Ruſſia, on the weſt.

VOLITION, the act of willing. See METAPHYSICS.

VOLKAMERIA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five ſegments; and the berry contains two bilocular ſeeds. There are two ſpecies, none of them native of Britain

VOLLEY, a military ſalute, made by diſcharging a great number of fire arms at the ſame time.

VOLO, in Roman antiquity, an appellation given to the ſlaves, who, during the ſecond Punic war, offered themſelves to ſerve in the army.

VOLT, in the manege, a round or circular tread; and hence by the phraſe, to make volts, is underſtood a gate of two treads, made by a horſe going ſideways round a center, in ſuch a manner, that theſe two treads make parallel tracts, one larger made by the fore-feet, and another ſmaller made by the hind-feet, the croup approaching towards the centre, and the ſhoulders bearing outwards.

VOLUME, in matters of literature, a book, or writing, of a juſt bulk to be bound by itſelf. The name is derived from the Latin *volvere*, to roll up; the ancient manner of making up books being in rolls of bark or parchment See BOOK.

VOLUNTARY, in muſick, a piece played by a muſician extempore, according to his fancy. This is often uſed before he begins to ſet himſelf to play any particular compoſition, to try the inſtrument, and to lead him into the key of the piece he intends to perform

VOLUNTEERS, in the military art, perſons who of their own accord, and at their own expence, ſerve in the army.

VOLUTA, in natural hiſtory, a genus of inſects belonging to the order of vermes teſtacea. It is an animal of the ſnail kind, with an unilocular ſpiral ſhell, of which there are 46 ſpecies, diſtinguiſhed by peculiarities in their ſhells.

VOLUTE, in architecture, a kind of ſpiral ſcroll, uſed in the

the Ionic and Composite capitals, whereof it makes the principal characteristic and ornament. See Architecture, p. 352.

VOLVULUS, in medicine, a name which some authors give to the iliac passion. See Medicine, p. 114.

VOMIR, in anatomy. See Anatomy, p. 163.

VOMICA, in medicine, is commonly taken for a suppurated imposthume, or an abscess with a suppuration. See Medicine, p. 104.

Nux Vomica, in pharmacy, a flat compressed round fruit, of the breadth of a shilling, or somewhat more, and of about the thickness of a crown-piece.

It is the nucleus of a fruit of an East-Indian tree, the wood of which is the lignum colubrinum of the shops.

Some have prescribed small doses of the nux vomica as a specific against a gonorrhœa, and others against quartan agues. But we have so many good and safe medidicines for all these purposes, that there seems no occasion for our having recourse to such as these, which shew so many signs of mischief.

VOMIT, in pharmacy. See Emetic.

VOMITING, in medicine, a retrograde spasmodic motion of the muscular fibres of the oesophagus, stomach, and intestines, attended with strong convulsions of the muscles of the abdomen and diaphragm, which, when gentle, create a nausea; when violent, a vomiting. See Medicine, p. 115.

VOORN, one of the islands of Holland, bounded by the river Maes, which divides it from the continent and the island of Issemunde, on the north; by the sea called the Bies-bosch, on the east; by another branch of the Maes, which divides it from the islands of Goree and Overflackee, on the south; and by the German sea, on the west; being about twenty-four miles long, and five broad.

VORTEX, in meteorology, a whirlwind, or sudden, rapid, and violent motion of the air in gyres, or circles.

Vortex is also used for an eddy or whirlpool; or a body of water, in certain seas or rivers, which runs rapidly around, forming a sort of cavity in the middle.

Vortex in the Cartesian philosophy, is a system or collection of particles of matter moving the same way, and round the same axis.

Such vortices are the grand machines, whereby those philosophers solve most of the motions and other phenomena of the heavenly bodies. Acordingly, the doctrine of these vortices marke a great part of the Cartesian philosophy.

VOTE, the suffrage or resolve of each of the members of an assembly, where any affair is to be carried by a majority; but more particularly used for the resolves of the members of either house of parliament.

VOTIVE medals, those on which are expressed the vows of the people for the emperors or empresses. See Medal.

VOW, a solemn and religious promise, or oath. See Oath.

The use of vows is found in most religions. They make up a considerable part of the pagan worship, being made either in consequence of some deliverance, under some pressing necessity, or for the success of some enterprize. Among the Jews all vows were to be voluntary, and made by persons wholly in their own power; and if such person made a vow, in any thing lawful and possible, he was obliged to fulfil it. If he appointed no particular time for accomplishing his vow, he was bound to do it instantly, lest by delay he should prove less able, or be unwilling, to execute his promise. Among the Romanists, a person is constituted a religious by taking three vows, that of poverty, chastity, and obedience.

VOWS, among the Romans, signified sacrifices, offerings, presents, and prayers made for the Cæsars and emperors, particularly for their prosperity and the continuance of their empire. These were at first made every five years, then every fifteen, and afterwards every twenty, and were called quinquennalia, decennalia, and vincennalia.

VOWEL, in grammar, a letter which affords a complete sound of itself, or a letter so simple as only to need a bare opening of the mouth to make it heard, and to form a distinct voice.

The vowels are six in number, *viz*. A, E, I, O, U, Y, and are called vowels, in contradistinction to certain other letters, which, depending on a particular application of some part of the mouth, as the teeth, lips or palate, can make no perfect sound without an opening of the mouth, that is, without the addition of a vowel, and are therefore called consonants.

UPHOLSTER, Upholsterer, or Upholder, a tradesman that makes beds, and all sorts of furniture thereunto belonging, *&c*.

UPLAND, denotes high ground, or, as some call it, terra firma, by which it stands opposed to such as is moorish, marshy, or low.

Upland, a province of Sweden, bounded by the province of Gestricia on the north-west, by the Baltic sea on the north-east and south-east, and by Sunderland and Westmania on the south and west.

UPPINGHAM, a market-town of England, in the county of Rutland, situated six miles south of Okeham.

UPRIGHT, in heraldry, is used in respect of shell-fishes, as crevices, *&c* when standing erect in a coat. Inasmuch as they want fins, they cannot, according to Guillim, be properly said to be hauriant, that being a term appropriated to scaly fishes.

UPSAL, a city once the capital of the province of Upland, and of all Sweden, being the only archbishop's see in Scandinavia, and an university; situated in E. long. 17° 30′, N. lat. 60°.

UPTON, a market-town of Worcestershire, nine miles south of Worcester.

UPUPA, in ornithology, a genus belonging to the order of picæ. The beak is arcuated, convex, and somewhat blunt; the tongue is obtuse, entire, triangular, and very short; and the feet are fitted for walking. There are two species, both natives of India.

URACHUS, a membranous canal in the fœtus of quadrupeds in general, of a pyramidal figure, extended immediately from the fundus of the bladder to the navel; and after passing through this, it is by degrees enlarged, and makes its way into the allantois at right-angles each way, or nearly so, and conveys the urine from the bladder into the cavity of this membrane.

URANBURG, or Uraniburg, a castle of Denmark, situated on the little island of Huen, in the Sound, sixteen miles north-east of Copenhagen. Here was the celebrated observatory built by that noble Dane Tycho Brahe, and furnished with instruments for observing the course and motions of the heavenly bodies.

URANO-

URANOSCOPUS, in ichthyology, a genus belonging to the order of jugulares. The head is large, rough, and depreffed, the upper jaw being fhorter than the under one; there are five dentated rays in the membrane of the gills; and the anus is in the middle of the body. There is but one fpecies, found in the Mediterranean fea.

URBINO, a province of Italy, in the pope's territory, bounded by Romania and the gulph of Venice on the north and eaft, by the marquifate of Ancona on the fouth, and by Tufcany on the weft, being feventy miles long, and from twenty to fifty broad.

Urbino is alfo the capital of this province.

URDE', or URDE'E, in heraldry. A crofs urdé feems to be the fame with what we otherwife call chleche, or chlechée. See CHLECHE.

URENA, in botany, a genus of the monadelphia polyandria clafs. The calix is double, the exterior one confifting of five fegments; the capfule has five cells containing one feed. There are three fpecies, all natives of China.

URETERS, in anatomy. See ANATOMY, p. 268.

URETHRA, in anatomy. See ANATOMY, p. 272.

URGEL, a town of Spain, in the province of Catalonia, capital of the territory of Urgel, fituated on the river Segra, feventy-five miles north of Barcelona.

URI, one of the cantons of Switzerland; bounded by that of Switz, on the north; by Glaris and the Grifons, on the eaft; by Underwald, on the fouth; and by the Canton of Bern, on the weft.

URIM and THUMMIM, among the ancient Hebrews, a certain oracular mannner of confulting God, which was done by the high prieft dreffed in his robes, and having on his pectoral or breaft-plate.

Various have been the fentiments of commentators concerning the urim and thummim. Jofephus, and feveral others, maintain, that it meant the precious ftones fet in the high prieft's breaft-plate, which by extraordinary luftre made known the will of God to thofe who confulted him. Spencer believes that the urim and thummim were two little golden figures fhut up in the pectoral as in a purfe, which gave refponfes with an articulate voice. In fhort, there are as many opinions concerning the urim and thummim as there are particular authors that wrote about them. The fafeft opinion, according to Broughton, feems to be, that the words urim and thummim fignify fome divine virtue and power annexed to the breaft-plate of the high prieft, by which an oraculous anfwer was obtained from God when he was confulted by the high-prieft; and that this was called urim and thummim to exprefs the clearnefs and perfection which thefe oracular anfwers always carried with them; for urim fignifies light, and thummim perfection; thefe anfwers not being imperfect and ambiguous, like the heathen oracles, but clear and evident. The ufe made of the urim and thummim was to confult God in difficult cafes relating to the whole ftate of Ifrael; and fometimes in cafes relating to the king, the fanhedrim, the general of the army, or fome other great perfonage.

URINAL, in medicine, a veffel fit to receive and hold urine, and ufed accordingly for the convenience of fick perfons. It is ufually of glafs, and crooked; and fometimes it is filled with milk, to affwage the pain of the gravel.

URINAL, in chemiftry, is an oblong glafs veffel, clofed for making folutions, and fo called from its refemblance to the glaffes in which urine is fet to fettle for the infpection of the phyfician.

URINE, a ferous and faline fluid, of a citron-colour, feparated from the blood, and carried by the emulgent arteries to the kidneys, from whence it defcends to the bladder by the ureters, and is from time to time emitted thence by the canal of the urethra. See ANATOMY, p. 268. For the analyfis of urine, fee CHEMISTRY, p. 177.

URN, a kind of vafe, of a roundifh form, but biggeft in the middle, like the common pitchers, now feldom ufed but in the way of ornament over chimney-pieces, in buffets, &c. The great ufe of urns among the ancients, was to preferve the afhes of the dead after they were burnt; for which reafon they were called cineraria, and urnæ cinerariæ, and were placed fometimes under the tomb-ftone whereon the epitaph was cut; and fometimes in vaults in their own houfes. Urns were alfo ufed at their facrifices to put liquid things in.

UROGALLUS, in ornithology. See TETRAO.

URSA, in aftronomy. See ASTRONOMY, p. 487.

URSULINES, in church-hiftory, an order of nuns, founded originally by St Angela of Brefcia, in the year fifteen hundred thirty-feven, and fo called from St Urfula, to whom they were dedicated. They obferve the rules of St Auguftine, and are chiefly noted for taking on them the education and inftruction of young maids: their monafteries are a kind of fchools where young ladies of the beft families receive their education.

URSUS, in zoology, a genus of quadrupeds belonging to the order of feræ. There are fix foreteeth in the upper jaw alternately hallow on the infide, and fix in the under jaw, the two lateral ones being labated; the dog-teeth are folitary and conical; the grinders are five or fix; the tongue is fmooth; the eyes are furnifhed with a nictitating membrane; the nofe is prominent; and there is a crooked bone in the penis. There are four fpecies, *viz.* 1. The arctas, or white bear, with an abrupt tail. He is a native of the northern parts of Europe, and feeds upon berries, infects, and the bodies of dead cattle. He is naturally a lazy animal; but when enraged, he becomes agile and furious, ftanding erect and fighting with his forefeet. When lying, he conftantly licks his paws. The female admits the male about the end of October, and fhe brings forth in 112 days. He never attacks a man, unlefs he be provoked. 2. The meles, has the tail of an uniform colour; the body is afh-coloured above and black below, with a longitudinal black belt acrofs the eyes and ears. He is likewife a native of Europe, and dwells in woods and the clifts of rocks. He feeds upon eggs, infects, the leaves of the lathynus, &c. In the night he preys upon rabbits, &c. and feldom appears in the day. He fhuts himfelf up in a den dug in the earth during the winter, and fucks a pellicle or bladder fituate above the anus. 3. The lator, has an annular tail, and a black belt acrofs the eyes. He is found about the fea-fhores of America. He feeds upon eggs, fowls, fnails, &c. 4. The lufcus, has a long tail; and the body is iron coloured. He is a native of Hudfon's bay.

URTICA, in botany, a genus of the monœcia tetrandria clafs. The calix of the male confifts of four leaves, and that

that of the female of two valves; neither of them have any corolla; the male has a cup-ſhaped nectarium, and the female bears one ſmooth ſeed. The ſpecies are 18, three of them natives of Britain, *viz.* the pilaſera, or Roman nettle; the arens, or leſſer nettle; and the dioica, or common nettle.

USANCE, in commerce, is a determinate time fixed for the payment of bills of exchange, reckoned either from the day of the bills being accepted, or from the day of their date; and thus called becauſe regulated by the uſage and cuſtom of the places whereon they are drawn.

USE, in law, the profit or benefit of lands and tenements; or a truſt and confidence repoſed in a perſon for the holding of lands, *&c.* that he to whoſe uſe the truſt is made ſhall receive the profits.

USEDOM, an iſland of Pomerania, in Germany, ſituated at the mouth of the river Oder, in the Baltic-ſea: ſubject to the king of Pruſſia.

USHANT, an iſland of France, fifteen miles weſt of the coaſt of Britany, at the entrance of the Britiſh channel.

USHER, an officer, or ſervant, who has the care and direction of the door of a court, hall, chamber, or the like.

USHER *of the black rod*, the eldeſt of the gentlemen uſhers, daily waiters at court, whoſe duty is to bear the rod before the king at the feaſt of St George, and other ſolemnities.

USK, a river of Wales, which riſes on the weſt of Brecknockſhire, and runs ſouth eaſt through that country and Monmouthſhire, falling into the mouth of the Severn.

USQUEBAUGH, a ſtrong compound liquor, chiefly taken by way of dram.

There are ſeveral different methods of making this liquor; but the following is eſteemed one of the beſt: To two gallons of brandy, or other ſpirits, put a pound of Spaniſh-liquorice, half a pound of raiſins of the ſun, four ounces of currants, and three of ſliced dates; the tops of baum, mint, ſavory, thyme, and the tops of the flowers of roſemary, of each two ounces; cinnamon and mace, well bruiſed, nutmegs, aniſeeds, and coriander-ſeeds, bruiſed likewiſe, of each four ounces; of citron, or lemon, and orange-peel, ſcraped, of each an ounce: let all theſe infuſe forty-eight hours in a warm place, often ſhaking them together: then let them ſtand in a cool place for a week: after which the clear liquor is to be decanted off, and to it is to be put an equal quantity of neat white port, and a gallon of canary; after which it is to be ſweetened with a ſufficient quantity of double-refined ſugar.

USTION, in pharmacy, the preparing of certain ſubſtances by burning them.

USTULATION, a word uſed by pharmaceutic writers, to expreſs the roaſting or torrefying of humid or moiſt ſubſtances over a gentle fire, ſo as to render them fit for powdering.

USUCAPTION, in the civil law, is an acquiſition of the property of a thing, by a poſſeſſion and enjoyment thereof for a certain term of years preſcribed by law.

USUFRUIT, in the civil law, the uſe or enjoyment of any lands or tenements; or the right of receiving the fruits and profits of an inheritance, or other thing, without a power of alienating or changing the property thereof.

USURER, a perſon charged with a habit or act of uſury. See USURY.

USURIOUS CONTRACT, is any bargain or contract whereby a man is obliged to pay more intereſt for money than the ſtatute allows.

USURPATION, in law, is an injurious uſing or enjoyment of a thing for continuance of time, that belongs of right to another.

USURY, in the general, denotes a gain or profit which a perſon makes of his money, by lending the ſame; or it is an increaſe of the principal, exacted for the loan thereof; or the price a borrower gives for the uſe of a ſum credited to him by the lender, called alſo intereſt.

The word uſury is generally taken in an evil ſenſe, *viz.* for an unlawful profit which a perſon makes of his money; in which ſenſe it is, that uſury is forbidden by the civil and eccleſiaſtical, and even by the law of nature. See LAW, Tit. xxxiii. 37.

UTERINE, ſomething belonging to the uterus or womb of a woman.

Brother or *Siſter* UTERINE, in Scots law. See LAW, Tit. xxvii. 3.

UTERUS, in anatomy. See ANATOMY, p. 274.

UTILE, a Latin term, ſignifying profitable or uſeful; in which ſenſe it is ſometimes uſed by Engliſh writers.

UTOXETER, a market-town of Staffordſhire, twelve miles ſouth-eaſt of Stafford.

UTRECHT, the capital of a province of the ſame name, in the united Netherlands, ſituated twenty-three miles ſouth-eaſt of Amſterdam.

UTRICULARIA, in botany, a genus of the diandria monogynia claſs. The corolla is ringent and calcarated; the calix conſiſts of two equal leaves; and the capſule of one cell. There are five ſpecies, two of them natives of Britain, *viz.* the vulgaris, or common hooded milfoil; and the minor, or leſſer hooded milfoil.

UVA URSI, in botany. See VACCINIUM.

UVEA, in anatomy. See ANATOMY, p. 289.

VULCANO, or VOLCANO, in natural hiſtory, a burning mountain, or one that vomits forth fire, flame, aſhes, cinders, *&c.*

As to the cauſe of vulcanos, it is found by experience, that there are ſeveral inflammable bodies, which, being mixed together in due proportion, will kindle into flame by fermentation alone, without the help of any fiery particles. Thus M. Lemery having covered up in the earth about fifty pounds of a mixture, compoſed of equal parts of ſulphur and filings of iron, tempered with water; after eight or nine hours time, the earth where it lay vomited up flames. From this experiment we ſee the true cauſe of the fire of Ætna, Veſuvius, and other burning mountains, which probably are made up of ſulphur and ſome other matter proper to ferment with it, and take fire.

VULGATE, a very ancient Latin tranſlation of the Bible, and the only one the church of Rome acknowledges authentic. See BIBLE.

VULNERARY, in medicine, an epithet given to remedies proper for the cure of wounds and ulcers.

VULPES, the Fox. See CANIS.

VULTUR, a genus of birds belonging to the order of accipitres. The beak is ſtrait, and crooked at the point; the head has no feathers, on the forepart being only naked ſkin; and the tongue is bifid. There are eight ſpe-

cies diſtinguiſhed principally by their colour and ſituation of caruncles.

VULVA, in anatomy. See ANATOMY, p. 275

VUULA, in anatomy. See ANATOMY, p. 303.

UVULARIA, in botany, a genus of the hexandria monogynia claſs. The corolla conſiſts of ſix ſtraight petals; the nectarii are little pits at the baſe of each petal; and the filaments are very ſhort. There are three ſpecies, none of them natives of Britain.

UXBRIDGE, a market-town of Middleſex, ſituated on the river Colne, fifteen miles weſt of London.

UZBECK, TARTARY, a large country of Aſia, bounded by Calmuc Tartary on the north, by Tibet on the eaſt, by India and Perſia on the ſouth, and by a great deſart, which ſeparates it from the Caſpian ſea, on the weſt.

W.

WAAG, a river of Hungary, which riſes in the Carpathian mountains, on the confines of Poland, and running firſt from eaſt to weſt, then turns ſouth, and paſſing by Leopoldſtadt, falls into the Danube, oppoſite to the iſland of Schut.

WAAL, a river of the United Netherlands, being one of the branches of the Rhine, which runs from eaſt to weſt, through the Betu, in the province of Guelderland, paſſing by Nimeguen, Tiel, Bommel, and Gorcum, and continuing its courſe eaſtward, unites its waters with the Maes, and, paſſing by Dort, falls into the German ſea below the Briel.

WADD, or WADDING, is a ſtopple of paper, hay, ſtraw, or the like, forced into a gun upon the powder, to keep it cloſe in the chamber; or to put up cloſe to the ſhot, to keep it from rolling out.

WADSET, in Scots law. See LAW, Tit. xv. 1, *&c.*

WAFT. To waft a ſhip, is to convoy her ſafe, as men of war do merchant ſhips. To make a waft, is to hang out ſome coat, ſea gown, or the like, on the main ſhrouds of the ſhip, as a ſignal for people to come aboard, and ſignifying that the ſhip is in great diſtreſs.

WAFERS, or *Sealing* WAFFERS, are made thus: take very fine flower, mix it with glair of eggs, iſinglaſs, and a little yeaſt; mingle the materials; beat them well together; ſpread the batter, being made thin with gum-water, on even tin plates; and dry them in a ſtove; then cut them out for uſe.

You may make them of what colour you pleaſe, by tinging the paſte with brazil or vermilion for red; indigo or verditer, *&c.* for blue; ſaffron, turmerics, or gambooge, *&c.* for yellow.

WAGGON, a wheel-carriage, of which there are various forms, accommodated to the different uſes they are intended for. The common waggon conſiſts of the ſhafts or rads, being the two pieces which the hind horſe bears up; the welds; the ſlotes, or croſs pieces, which hold the ſhafts together; the bolſter, being that part on which the fore wheels and the axle-tree turn in wheeling the waggon acroſs the road; the cheſt or body of the waggon, having the ſtaves or rails fixed thereon; the bales, or hoops, which compoſe the top; the tilt, the place covered with cloth, at the end of the waggon. See MECHANICS, p. 50.

WAGRIA, the eaſtern diviſion of the duchy of Holſtein, in the circle of Lower Saxony, in Germany, bounded by the Baltic ſea on the north, eaſt, and ſouth.

WAGTAIL, in ornithology. See MOTACILLA.

WAIF, in law, a term applied to ſuch goods as a thief having feloniouſly ſtolen, on his being cloſely purſued are waved or left by the felon, which become forfeited to the king, or lord of the manor.

WAIGRATS STRAITS, ſituated between Nova Zembla and Ruſſia, through which the Dutch ſailed to the north, as high as 75°, in order to diſcover a north-eaſt paſſage to China and the Eaſt Indies.

WAINSCOT, in building, the timber work that ſerves to line the walls of a room, being uſually made in pannels, and painted, to ſerve inſtead of hangings.

WAKE *of a ſhip*, is the ſmooth water aſtern when ſhe is under ſail: this ſhews the way ſhe has gone in the ſea, whereby the mariners judge what way ſhe makes.

WAKE, is the eve-feaſt of the dedication of churches, which is kept with feaſting and rural diverſions.

WAKEFIELD, a market-town in the weſt-riding of Yorkſhire, ſituated on the river Caulder, twenty-four miles ſouth-weſt of York.

Action of WAKENING, in Scots law. See LAW, Tit. xxx. 26

WALACHIA, a province of Turky in Europe, bounded by the Irongate mountains, which ſeparate it from Tranſilvania, on the north-weſt; by Moldavia, on the north-eaſt; by the river Danube, which ſeparates it from the province of Bulgaria, on the ſouth-eaſt; and the ſame river ſeparates it from the province of Servia on the ſouth-weſt. It is two hundred miles long, and one hundred broad.

WALCOURT, a town of the biſhopric of Liege, ſituated on the confines of Namur, eighty miles ſouth of Charleroy.

WALDEC, a town of Germany, in the circle of the Upper Rhine, and landgraviate of Heſſe Caſſel, twenty miles ſouth weſt of Heſſe Caſſel city.

WALDEN a market-town of Eſſex, ſituated twenty-five miles north-weſt of Chelmsford.

WALE, or WALES, in a ſhip, thoſe outermoſt timbers in a ſhip's ſide, on which the ſailors ſet their feet in climbing up. They are reckoned from the water, and are called her firſt, ſecond, and third wale, or bend.

WALE-

WALE-KNOT, a round knot or knob made with three ſtrands of a rope, ſo that it cannot ſlip, by which the tacks, top-ſail ſheets, and ſtoppers are made faſt, as alſo ſome other ropes.

WALE-REARED, on board a ſhip, a name the ſeamen give to a ſhip, which, after ſhe comes to her bearing, is built ſtrait up: this way of building, though it does not look well, nor is, as the ſeamen term it, ſhip-ſhapen; yet it has this advantage, that a ſhip is thereby more roomy within board, and becomes thereby a wholeſome ſhip at ſea, eſpecially if her bearing be well laid out.

WALES, a principality in the weſt of England, comprehending 12 counties, bounded by Cheſhire, Shropſhire, Herefordſhire, and Monmouthſhire, on the eaſt, and ſurrounded by the ſea called the Iriſh channel, on the north, weſt, and ſouth.

New WALES, the ſouth-weſt coaſt of Hudſon's Bay, in North America, ſo called; now poſſeſſed by the Engliſh Hudſon's Bay company.

WALL in architecture, the principal part of a building, as ſerving both to incloſe it, and ſupport the roof, floors, *&c.*

Walls are diſtinguiſhed into various kinds, from the matter whereof they conſiſt, as plaſtered or mud-walls, brick-walls, ſtone-walls, flint or boulder walls, and boarded walls. See ARCHITECTURE.

WALLINGFORD, a borough-town of Berkſhire, ſituated on the river Thames, twelve miles north of Reading.

WALLOONS, the inhabitants of a conſiderable part of the Spaniſh Netherlands, *viz* thoſe of Artois, Hainault, Namur Luxemburgh, and part of Flanders and Brabant.

The Walloon language is ſaid to have been that of the ancient Gauls or Celts.

WALRUS, in zoology. See PHOCA.

WALNUT TREE in botany See JUGLANS.

WALSALL, a market-town of Staffordſhire, thirteen miles ſouth of Stafford

WALSHAM a market-town of Norfolk, eleven miles north of Norwich.

WALSINGHAM, a market town of Norfolk, eighteen miles north-weſt of Norwich.

WALTHAM, a market town of Leiceſterſhire, ſixteen miles north eaſt of Leiceſter.

WALTHERIA, in botany, a genus of the monadelphia pentandria claſs.

WAPENTAKE, (from the Saxon) the ſame with what we call a hundred, and more eſpecially uſed in the northern counties beyond the river Trent. There have been ſeveral conjectures as to the original of the word; one of which is, that anciently muſters were made of the armour and weapons of the inhabitants of every hundred; and from thoſe that could not find ſufficient pledges of their good abearing, their weapons were taken away, and given to others; whence, it is ſaid, this word is derived. See HUNDRED

WAR, a conteſt or difference between princes, ſtates, or large bodies of people; which not being determined by the ordinary meaſures of equity and juſtice, is referred to the deciſion of the ſword.

WARD, a word of divers ſignifications: thus, a ward in London, is a part of the city committed to the ſpecial charge of one of the aldermen of the city. There are twenty-ſix wards in London, which are as hundreds, and the pariſhes thereof as towns. A foreſt is alſo divided into wards, and ſo are moſt of our hoſpitals.

WARD-HOLDING, in Scots law, See LAW, Tit. xi. 1.

WARD-HOOK, or WADD-HOOK, in gunnery, a rod or ſtaff with an iron end turned ſerpent-wiſe, or like a ſcrew, to draw the wadding out of a gun when it is to be unloaded. See WADD.

WARDEN, or GUARDIAN, one who has the charge or keeping of any perſon, or thing, by office. See GUARDIAN.

Such is the warden of the fleet, the keeper of the fleet-priſon; who has the charge of the priſoners there, eſpecially ſuch as are committed from the court of chancery for contempt.

Church WARDENS. See CHURCH.

WARDHUYS, a port of Norwegian Lapland, 120 miles ſouth-eaſt of the north cape: E. long. 28°; and N. lat. 71°.

WARDMOTE, in London, is a court ſo called, which is kept in every ward of the city, anſwering to the curiata comitia in ancient Rome

WARDROBE, a cloſet, or little room adjoining to a bedchamber, ſerving to diſpoſe and keep a perſon's apparel in; or, for a ſervant to lodge in, to be at hand to wait, *&c.*

Wardrobe, in a prince's court, is an apartment wherein his robes, wearing apparel, and other neceſſaries, are preſerved under the care and direction of proper officers; as the maſter of the wardrobe, clerk, *&c.* of the wardrobe.

WARE, a market-town of Hertfordſhire, under the meridian of London, and twenty miles north of that city.

WAREHAM, a borough of Dorſetſhire, ſeventeen miles eaſt of Dorcheſter

WARMINSTER, a market-town of Wiltſhire, ſeventeen miles north-weſt of Saliſbury.

WARN, in law, is to ſummon a perſon to appear in a court of juſtice.

WARNING *of Tenants*, in Scots law. See LAW, Tit. xiii. 16.

WARP, in the manufactures, is the threads, whether of ſilk, wool, linen, hemp, *&c.* that are extended lengthwiſe on the weaver's loom; and acroſs which the workman by means of his ſhuttle paſſes the threads of the woof, to form a cloth, ribband, fuſtian, or other matter.

WARRANDICE, in Scots law. See LAW, Tit. x. 11.

WARRANT, an act, inſtrument, or obligation, whereby a perſon authoriſes another to do ſomething which he otherwiſe had not a right to do.

WARRANTY, a promiſe or covenant by deed, made by the bargainer for himſelf and his heirs, to warrant and ſecure the bargainee and his heirs againſt all men for enjoying the thing agreed on between them.

WARREN, a franchiſe, or place privileged either by preſcription or grant from the king, to keep beaſts and fowl of warren in; as rabbits, hares, partridges, pheaſants, *&c.*

WARRINGTON, a market-town of Lancaſhire, ſeventeen miles eaſt of Liverpool.

WARSAW, the capital of Warſovia, and of the kingdom of Poland: E. long. 21° 5′, and N. lat. 52° 15′.

WARSOVIA, a province of Poland, bounded by Pruſſia, on the north; by Polachia, on the eaſt; by the province of Little Poland, on the ſouth; and by that of Great Poland, on the weſt.

WART

WART, in ſurgery, a little round hard excreſcence ariſing from the fleſh like a pea.

WARWICK, the capital of Warwickſhire, ſituated on the river Avon, eighty miles north-weſt of London: W. long. 1° 32′, N. lat. 52° 20′.

WASH, among diſtillers, the fermentable liquor uſed by the malt-diſtillers. See BREWERY.

WASHING, in painting, is when a deſign, drawn with a pen or crayon, has ſome one colour laid over it with a pencil, as Indian ink, biſtre, or the like, to make it appear the more natural, by adding the ſhadow of prominences, aperture, *&c.* and by imitating the particular matters whereof the thing is ſuppoſed to conſiſt.

Thus they waſh with a pale red, to imitate brick and tile; with a pale Indian-blue, to imitate water and ſlate; with green, for trees and meadows; with ſaffron or French berries, for gold or braſs; and with ſeveral colours, for marbles.

WASHING *of Ores*, the purifying an ore of any metal, by means of water, from earths and ſtones, which would otherwiſe render it difficult of fuſion. See CHEMISTRY, p. 130.

WASP, in zoology. See VESPA.

WASTE *of a Ship*, is that part of her between the main and fore maſt.

WASTE-BOARDS, are boards ſometimes ſet upon the ſide of a boat, or other veſſel, to keep the ſea from breaking into her.

WATCH, in the art of war, a number of men poſted at any paſſage, or a company of the guards who go on the patrol.

WATCH and CLOCK WORK.

A CLOCK is a machine conſtructed in ſuch a manner, and regulated by ſuch uniform movements, as to meaſure time and all its ſubdiviſions with great exactneſs. The ſame definition comprehends watches of all kinds; and indeed they are both made upon the ſame principles. We ſhall therefore give a view of the conſtruction of both theſe machines under this article.

Of the Mechaniſm of CLOCKS, *and how they meaſure Time.*

THE firſt figure of Plate CLX is a profile of a clock; P is a weight ſuſpended by a rope that winds about the cylinder or barrel C, which is fixed upon the axis *a a*; the pivots *b b* go into holes made in the plates TS, TS, in which they turn freely. Theſe plates are made of braſs or iron, and are connected by means of *four pillars* Z Z; and the whole together is called the frame.

The weight P, if not reſtrained, would neceſſarily turn the barrel C with an uniform accelerated motion, in the ſame manner as if the weight was falling freely from a height. But the barrel is furniſhed with a ratchet wheel K K, the right ſide of whoſe teeth ſtrikes againſt the click, which is fixed with a ſcrew to the wheel D D, as repreſented in fig. 2. ſo that the action of the weight is communicated to the wheel D D, the teeth of which act upon the teeth of the ſmall wheel *d* which turns upon the pivots *c c*. This communication of the teeth of one wheel with another is called engrenage or pitching; and a ſmall wheel, like *d*, is called a pinion.

The wheel E E is fixed upon the axis of the pinion *d*; and the motion communicated to the wheel D D by the weight is tranſmitted to the pinion *d*, conſequently to the wheel E E, as likewiſe to the pinion *e*, and wheel F F, which moves the pinion *f*, upon the axis of which the crown or balance wheel G H is fixed. The pivots of the pinion *f* play in holes of the plates L M which are fixed horizontally to the plates T S. In a word, the motion begun by the weight is tranſmitted from the wheel G H to the palettes I K, which communicates its motion by means of the fork U X riveted on the palettes, to the pendulum A B, which is ſuſpended upon the hook A. The pendulum A B deſcribes, round the point A, an arc of a circle alternately going and returning. If then the pendulum be once put in motion by a puſh of the hand, the weight of the pendulum at B will make it return upon itſelf, and it will continue to go alternately backward and forward till the reſiſtance of the air upon the pendulum, and the friction at the point of ſuſpenſion at A, deſtroys the original impreſſed force. But as, at every vibration of the pendulum, the teeth of the balance-wheel G H act ſo upon the palettes I K, (the pivots upon the axis of theſe palettes play in two holes of the potence *s t*,) that after one tooth H has communicated motion to the palette K, that tooth eſcapes; then the oppoſite tooth G acts upon the palette I, and eſcapes in the ſame manner; and thus each tooth of the wheel eſcapes the palettes I, K, after having communicated their motion to the palettes in ſuch a manner that the pendulum, inſtead of being ſtopt, continues to move.

The wheel E E revolves in an hour; the pivot *c* of this wheel paſſes through the plate, and is continued to *r*; upon the pivot is a wheel N N with a long ſocket faſtened in the centre; upon the extremity of this ſocket *r* the minute-hand is fixed. The wheel N N acts upon the wheel O; the pinion of which, *p*, acts upon the wheel *g g*, fixed upon a ſocket which turns along with the wheel N This wheel *g g* makes its revolution in 12 hours, upon the barrel of which the hour-hand is fixed.

From the above deſcription it is eaſy to ſee, 1. That the weight *p* turns all the wheels, and at the ſame time continues the motion of the pendulum 2. That the quickneſs of the motion of the wheels is determined by that of the pendulum. 3 That the wheels point out the parts of time divided by the uniform motion of the pendulum

When the cord upon which the weight is ſuſpended is entirely run down from off the barrel, it is wound up again by means of a key, which goes on the ſquare end of the arbor at Q. by turning it in a contrary direction from that in which the weight deſcends. For this purpoſe, the inclined ſide of the teeth of the wheel R (fig. 2) removes the click C, ſo that the ratchet-wheel R turns while the wheel D is at reſt: But as ſoon as the cord is wound up, the click falls in between the teeth of the wheel D and the right ſide of the teeth again act upon the end of the click, which obliges the

the wheel D to turn along with the barrel; and the ſpring A keeps the crank between the teeth of the ratchet-wheel R.

We ſhall now explain how time is meaſured by the motion of the pendulum; and how the wheel E, upon the axis of which the minute-hand is fixed, makes but one preciſe revolution in an hour. The vibrations of a pendulum are performed in a ſhorter or longer time in proportion to the length of the pendulum itſelf. A pendulum of 3 feet $8\frac{1}{2}$ French lines in length, makes 3600 vibrations in an hour; *i. e.* each vibration is performed in a ſecond of time, and for that reaſon it is called a *ſecond pendulum*. But a pendulum of 9 inches $2\frac{1}{4}$ French lines makes 7200 vibrations in an hour, or two vibrations in a ſecond of time, and is called *a half-ſecond pendulum*. Hence, in conſtructing a wheel whoſe revolution muſt be performed in a given time, the time of the vibrations of the pendulum which regulates its motion muſt be conſidered. Suppoſing, then, that the pendulum AB makes 7200 vibrations in an hour, let us conſider how the wheel E ſhall take up an hour in making one revolution. This entirely depends on the number of teeth in the wheels and pinions. If the balance-wheel conſiſts of 30 teeth, it will turn once in the time that the pendulum makes 60 vibrations: for at every turn of the wheel, the ſame tooth acts once on the palette I, and once on the palette K, which occaſions two ſeparate vibrations in the pendulum; and the wheel having 30 teeth, it occaſions twice 30, or 60 vibrations. Conſequently, this wheel muſt perform 120 revolutions in an hour; becauſe 60 vibrations, which it occaſions at every revolution, are contained 120 times in 7200, the number of vibrations performed by the pendulum in an hour. Now in order to determine the number of teeth for the wheels E F, and their pinions *e f*, it muſt be remarked, that one revolution of the wheel E muſt turn the pinion *e* as many times as the number of teeth in the pinion is contained in the number of teeth in the wheel. Thus, if the wheel E contains 72 teeth, and the pinion *e* 6, the pinion will make twelve revolutions in the time that the wheel makes one; for each tooth of the wheel drives forward a tooth of the pinion, and when the ſix teeth of the pinion are moved, a complete revolution is performed; but the wheel E has by that time only advanced ſix teeth, and has ſtill 66 to advance before its revolution be compleated, which will occaſion 11 more revolutions of the pinion. For the ſame reaſon, the wheel F having 60 teeth, and the pinion *f* 6, the pinion will make 10 revolutions while the wheel performs one. Now, the wheel F being turned by the pinion *e*, makes 12 revolutions for one of the wheel E; and the pinion *f* makes ten revolutions for one of the weel F; conſequently, the pinion *f* performs 10 times 12 or 120 revolutions in the time the wheel E performs one. But the wheel G, which is turned by the pinion *f*, occaſions 60 vibrations in the pendulum each time it turns round; conſequently the wheel G occaſions 60 times 120 or 7200 vibrations of the pendulum while the wheel E performs one revolution; but 7200 is the number of vibrations made by the pendulum in an hour, and conſequently the wheel E performs but one revolution in an hour; and ſo of the reſt.

From this reaſoning, it is eaſy to diſcover how a clock may be made to go for any length of time without being wound up: 1. By increaſing the number of teeth in the wheels. 2. By diminiſhing the number of teeth in the pinions. 3. By increaſing the length of the cord that ſuſpends the weight; and laſtly, by adding to the number of wheels and pinions. But, in proportion as the time is augmented, if the weight continues the ſame, the force which it communicates to the laſt wheel GH will be diminiſhed.

It only remains to take notice of the number of teeth in the wheels which turn the hour and minute hands.

The wheel E performs one revolution in an hour; the wheel NN, which is turned by the axis of the wheel E, muſt likewiſe make only one revolution in the ſame time; and the minute-hand is fixed to the barrel of this wheel. The wheel N has 30 teeth, and acts upon the wheel O, which has likewiſe 30 teeth, and the ſame diameter; conſequently the wheel O takes one hour to a revolution: now the wheel O carries the pinion *p*, which has ſix teeth, and which acts upon the wheel *qq* of 72 teeth; conſequently the pinion *p* makes 12 revolutions while the wheel *qq* makes one, and of courſe the wheel *qq* takes 12 hours to one revolution; and upon the barrel of this wheel the hour-hand is fixed. We ſhall conclude with remarking, that all that has been ſaid here concerning the revolutions of the wheels, *&c.* is equally applicable to watches as to clocks.

Of the Mechaniſm of a WATCH.

WATCHES, as well as clocks, are compoſed of wheels and pinions, and a regulator to direct the quickneſs or ſlowneſs of the wheels, and of a ſpring which communicates motion to the whole machine. But the regulator and ſpring of a watch are vaſtly inferior to the weight and pendulum of a clock, neither of which can be employed in watches. In place of a pendulum, therefore, we are obliged to uſe a balance (fig. 4.) to regulate the motion of a watch; and of a ſpring (fig. 6.) which ſerves in place of a weight, to give motion to the wheels and balance.

The wheels of a watch, like thoſe of a clock, are placed in a frame formed of two plates and four pillars Fig. 3. repreſents the inſide of a watch, after the plate (fig. 5.) is taken off. A is the barrel which contains the ſpring (fig. 6.) the chain is rolled about the barrel, with one end of it fixed to the barrel A, and the other to the fuſee B.

When a watch is wound up, the chain which was upon the barrel winds about the fuſee, and by this means the ſpring is ſtretched; for the interior end of the ſpring is fixed by a hook to the immoveable axis, about which the barrel revolves; the exterior end of the ſpring is fixed to the inſide of the barrel, which turns upon an axis. It is therefore eaſy to perceive how the ſpring extends itſelf, and how its elaſticity forces the barrel to turn round, and conſequently obliges the chain which is upon the fuſee to unfold and turn the fuſee; the motion of the fuſee is communicated to the wheel CC; then, by means of the teeth, to the pinion *c*, which carries the wheel D; then to the pinion *d*, which carries the wheel E; then to the pinion *e*, which carries the wheel F; then to the pinion *f*, upon which is the balance-wheel G, whoſe pivot runs in the pieces A called a potance, and B called the follower, which are fixed on the plate, fig. 5. This plate, of which only a part is repreſented, is applied to that of (fig. 3.) in ſuch a manner, that the pivots of the wheels enter into holes made in the plate (fig. 3.) Thus the impreſſed force of the ſpring is communicated to the wheels; and the pinion *f* being then connected to the wheel F, obliges it to turn, (fig. 7.) This wheel acts upon the palettes of the verge 1. 2, (fig. 4.) the axis of which carries the balance

HH, (fig. 4) The pivot I, in the end of the verge, enters into the hole *c* in the potance A (fig. 5.) In this figure the palettes are represented; but the balance is on the other fide of the plate, as may be feen in fig. 11. The pivot 3 of the balance enters into a hole of the cock BC, (fig. 10) a perfpective view of which is reprefented in (fig. 12.) Thus the balance turns between the cock and the potance *c*, (fig. 5.) as in a kind of cage. The action of the balance-wheel upon the palettes 1, 2, (fig. 4.) is the fame with what we have defcribed with regard to the fame wheel in the clock; *i. e.* in a watch the balance wheel obliges the balance to vibrate backwards and forward like a pendulum. At each vibration of the balance a palette allows a tooth of the balance-wheel to efcape, fo that the quicknefs of the motion of the wheels is entirely determined by the quicknefs of the vibrations of the balance, and thefe vibrations of the balance and motion of the wheels are produced by the action of the fpring.

But the quicknefs or flownefs of the vibrations of the balance depend not folely upon the action of the great fpring, but chiefly upon the action of the fpring *a*, *b*. *c*, called the fpiral fpring, (fig. 14) fituated under the balance H, and reprefented in perfpective (fig. 11.) The exterior end of the fpiral is fixed to the pin *a*, (fig. 14.) This pin is applied near the plate in *a*, (fig. 11.) the interior end of the fpiral is fixed by a peg to the centre of the balance. Hence if the balance is turned upon itfelf, the plates remaining immoveable, the fpring will extend itfelf, and make the balance perform one revolution. Now, after the fpiral is thus extended, if the balance be left to itfelf, the elafticity of the fpiral will bring back the balance, and in this manner the alternate vibrations of the balance are produced.

In fig 7 all the wheels above defcribed are reprefented in fuch a manner, that you may eafily perceive at firft fight how the motion is communicated from the barrel to the balance.

In fig 8. are reprefented the wheels under the dial-plate by which the hands are moved. The pinion *a* is adjufted to the force of the prolonged pivot of the wheel D, (fig 7.) and is called a cannon pinion. This wheel revolves in an hour. The end of the axis of the pinion *a*, upon which the minute-hand is fixed, is fquare; the pinion (fig. 8.) is indented into the wheel *b*, which is carried by the pinion *a*. Fig. 9. is a wheel fixed upon a barrel, into the cavity of which the pinion (*a*) enters, and upon which it turns freely. This wheel, (*d*) revolves in 12 hours, and carries along with it the hour-hand.

WATCHING, in medicine, is produced by too great a determination of the nervous fluid to the organs of the fenfes; whereby thefe organs are prepared to receive, readily, any impreffions from external objects, which they propagate to the brain, and furnifh the foul with divers occafions of thinking. See MEDICINE, p. 157.

WATER, in phyfiology, a fimple fluid, and liquid body, reputed the third of the four vulgar elements. See CHEMISTRY, p. 67. and HYDROSTATICS.

Holy WATER, a water prepared every Sunday in the Romifh church, with divers prayers, exorcifms, *&c.* ufed by the people to crofs themfelves withal at their entrance to and going out of church; and pretended to have the virtue of wafhing away venial fins, driving away devils, preferving from thunder, diffolving charms, fecuring from, or curing difeafes, *&c.* Many of the reformed take the ufe of holy water to have been borrowed from the luftral water of the ancient Romans.

WATER ORDEAL, or TRIAL, among our anceftors, was of two kinds, by hot and by cold water. Trial or purgation, by boiling or hot water, was a way of proving crimes, by immerging the body, or the arm, in hot water, with divers religious ceremonies. In the judgment by boiling water, the accufed, or he who perfonated the accufed, was obliged to put his naked arm into a caldron full of boiling water, and to draw out a ftone thence placed at a greater or lefs depth, according to the quality of the crime. This done, the arm was wrapped up, and the judge fet his feal on the cloth; and at the end of three days they returned to view it: when if it were found without any fcald, the accufed was declared innocent. The nobles or great perfonages purged themfelves thus by hot water, and the populace by cold water. The trial, or purgation, by cold water, was thus: After certain prayers and other ceremonies, the accufed was fwaddled or tied up all in a pelotoon or lump, and thus caft into a river, lake, or veffel of cold water; where if he funk, he was held criminal; if he floated, innocent.

In the Levitical law, we find mention made of water which ferved to prove whether or no a woman was an adulterefs; the formula, as it was performed by the prieft, may be feen in the fifth chapter of the book of Numbers.

WATER, among jewellers, is properly the colour or luftre of diamonds and pearls. The term, though lefs properly, is fometimes ufed for the hue or colour of other ftones.

WATER *Beetle*, in zoology. See DYTISCUS.

WATER BORNE, in the fea-language. A fhip is faid to be water-borne, when fhe is where there is no more water than will barely bear her from the ground; or when lying even with the ground, fhe firft begins to float or fwim.

WATER COLOURS, in painting, are fuch colours as are only diluted and mixed up with gum-water, in contradiftinction to oil-colours.

WATER GANG, a channel cut to drain a place by carrying off a ftream of water.

WATER-LINE *of a Ship*, a line which diftinguifhes that part of her under water from that above, when fhe is duly laden.

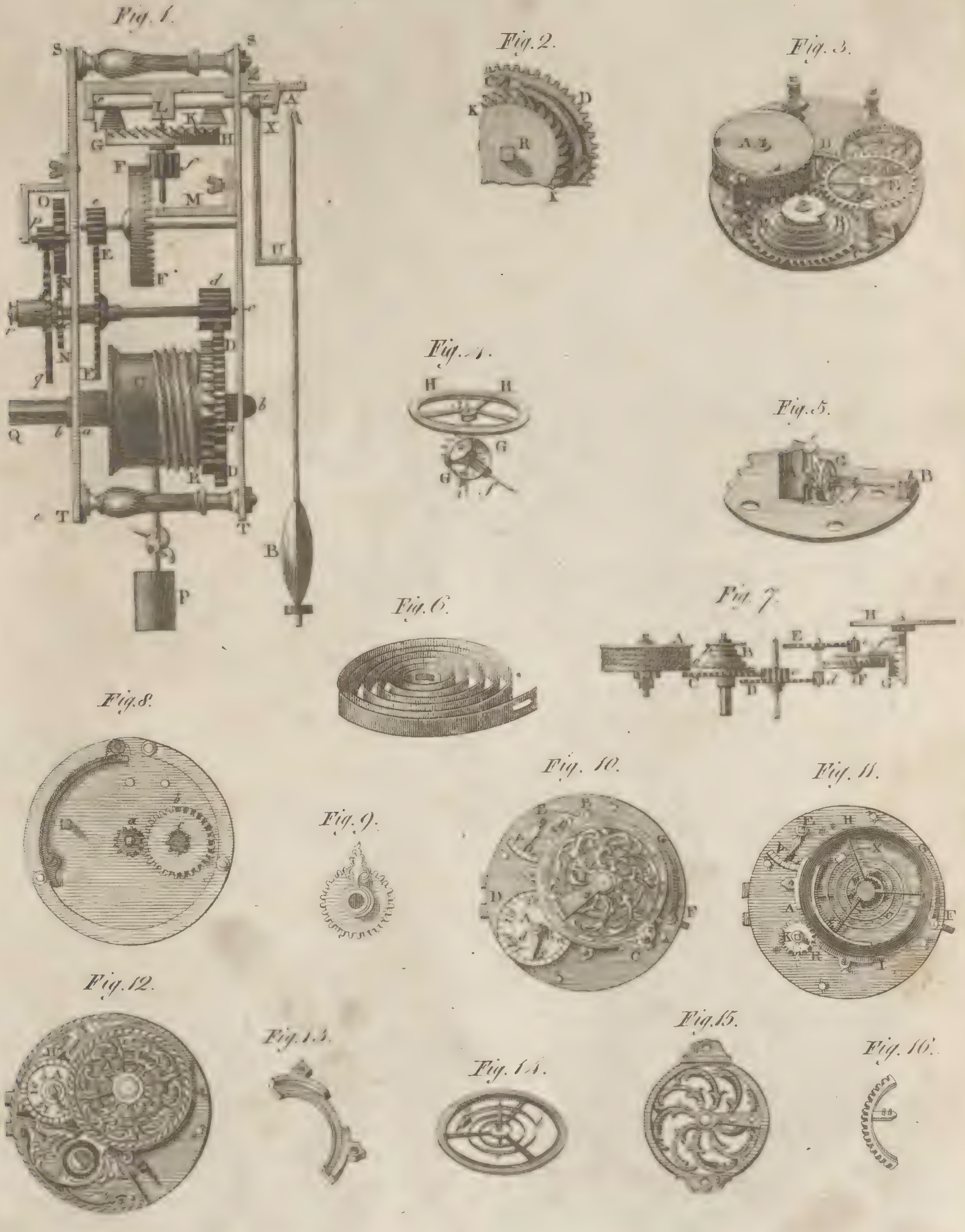
WATER-MEN, are fuch as row in boats, or ply on the river Thames, in the government of whom the lord-mayor of London, and court of aldermen there, had always great power. They ftill have the appointing of their fares, the taking more than which makes them liable to a fine of 40s. and half a year's imprifonment.

WATER-SHOOT, a young fprig which fprings out of the root or ftock of a tree.

WATER SHOT, in the fea-language, a fort of riding at anchor, when a fhip is moored neither crofs the tide, nor right up and down, but quartering betwixt both.

WATER-TABLE, in architecture, a fort of ledge left in ftone

WATCH and CLOCK WORK. Plate CLX.



A. Bell sc.

ſtone or brick-walls, about eighteen or twenty inches from the ground, from which place the thickneſs of the wall begins to abate.

WATER WAY, in a ſhip, is a ſmall ledge of timber, lying fore and aft on the deck, cloſe by her ſides, to keep the water from running down there.

WATER-WORKS, in general, denote all manner of machines moved by, or employed in raiſing or ſuſtaining water; in which ſenſe, water-mills of all kinds, ſluices, aquæducts, *&c.* may be called water-works. See HYDROSTATICS.

WATERFORD, a port-town of Ireland, capital of the county of Waterford, ſituated on the river Sure, eight miles north of the ſea: W. long. 7°, N. lat. 52° 12′.

It is one of the largeſt cities in Ireland, and has a good foreign trade.

WATERING, in the manufactures, is to give a luſtre to ſtuffs, *&c.* by wetting them lightly with gum-water, and then paſſing them through the preſs, or calender, whether hot or cold.

The gum-water ought to be pure, thin, and clear, otherwiſe the folds of the ſtuff will ſtick together: the operation muſt alſo be performed when the water is very hot, that it may penetrate.

WATLINGTON, a market-town of Oxfordſhire, ſituated twelve miles ſouth-eaſt of Oxford.

WATTON, a market-town of Norfolk, ſixteen miles ſouth-weſt of Norwich.

WAVE, in philoſophy, a cavity in the ſurface of water, or other fluid, with an elevation aſide thereof.

The waves of the ſea are of two kinds, natural and accidental. The natural waves are thoſe which are exactly proportioned in ſize to the ſtrength of the wind, whoſe blowing gives origin to them. The accidental waves are thoſe occaſioned by the wind's re-acting upon itſelf by repercuſſion from hills and mountains, or high ſhores, and by the waſhing of the waves themſelves, otherwiſe of the natural kind, againſt rocks and ſhoals: all theſe caſes give the waves an elevation, which they can never have in their natural ſtate.

Mr. Boyle has proved, by numerous experiments, that the moſt violent wind never penetrates deeper than ſix feet into the water; and it ſhould ſeem a natural conſequence of this, that the water moved by it can only be elevated to the ſame height of ſix feet from the level of the ſurface in a calm: and this ſix feet of elevation being added to the ſix of excavation, in the part whence that water ſo elevated was raiſed, ſhould give twelve feet for the utmoſt elevation of a wave. This is a calculation that does great honour to its author; for count Marſigli meaſured carefully the elevation of the waves near Provence, and found, that, in a very violent tempeſt, they aroſe only to ſeven feet above the natural level of the ſea, and this additional foot in height he eaſily reſolved into the accidental ſhocks of the water againſt the bottom, which was, in the place he meaſured them in, not ſo deep as to be out of the way of affecting the waves; and he allows that the addition of one ſixth of the height of a wave, from ſuch a diſturbance from the bottom, is a very moderate alteration from what would have been its height in a deep ſea; and concludes, that Mr. Boyle's calculation holds perfectly right in deep ſeas, where the waves are purely natural, and have no accidental cauſes to render them larger than their juſt proportion. In deep water, under the high ſhores of the ſame part of France, this author found the natural elevation of the waves to be only five feet; but he found alſo, that their breaking againſt rocks, and other accidents to which they were liable in this place, often raiſed them to eight feet high.

We are not to ſuppoſe, from this calculation, that no wave of the ſea can riſe more than ſix feet above its natural level in open and deep water; for waves immenſely higher than theſe are formed, in violent tempeſts, in the great ſeas. Theſe, however, are not to be accounted waves in their natural ſtate; but they are ſingle waves formed of many others: for in theſe wide plains of water, when one wave is raiſed by the wind, and would elevate itſelf up to the exact height of ſix feet, and no more, the motion of the water is ſo great, and the ſucceſſion of the waves ſo quick, that, during the time this is riſing, it receives into it ſeveral other waves, each of which would have been at the ſame height with itſelf; theſe run into the firſt wave, one after another, as it is riſing; by this means its riſe is continued much longer than it naturally would have been, and it becomes terribly great. A number of theſe complex waves ariſing together, and being continued in a long ſucceſſion by the continuation of the ſtorm, make the waves ſo dangerous to ſhips, which the ſailors in their phraſe call mountains-high.

WAVE-OFFERING, in Jewiſh antiquity, a ſacrifice offered by agitation, or waving, towards the four cardinal points of the compaſs.

WAVED, in heraldry, is ſaid of a bordure, or any ordinary, or charge, in a coat of arms, having its outlines indented in manner of the riſing and falling of waves: it is uſed to denote, that the firſt of the family in whoſe arms it ſtands, acquired its honours for ſea-ſervice.

WAVING, in the ſea-language, is the making ſigns to a veſſel to come near or keep off.

WAX, or *Bees*-WAX, in natural hiſtory, a firm and ſolid ſubſtance, moderately heavy, and of a fine yellow colour, formed by the bees from the farina of flowers. See APIS.

The beſt ſort is that of a lively yellow colour, and an agreeable ſmell, ſomewhat like that of honey: when new, it is toughiſh, yet eaſy to break; but by age it becomes harder and more brittle, loſes its fine colour, and in a great meaſure its ſmell.

From the common yellow wax, by the mere effect of ſun and air, or by what is called bleaching, is formed what we term white-wax, and ſome, very improperly, virgin-wax. The greater the ſurface is in proportion to the quantity, the ſooner and more perfectly this operation is performed. The uſual way is to melt the wax in hot water; when melted, they preſs it through a ſtrainer of tolerable fine linen, and pour it into round and very ſhallow moulds. When hardened by cooling, it is taken out and expoſed to the ſun and air, ſprinkling it now and then with water, and often turning it: by this means it ſoon becomes white. The beſt ſort is of a clear and almoſt tranſparent whiteneſs, dry, hard, brittle, and of an agreeable ſmell, like that of the yellow wax, but much weaker.

The common yellow wax is of very great uſe both in medicine and in many of the arts and manufactures. It is ſometimes given internally, as in dyſenteries, and other eroſions

erosions of the intestines; but its great use is in the making ointments and plasters for external use, and the greater part of those of the shops owe their consistence to it. The white-wax is also an ingredient in some of the cerates and ointments of the shops; and is used in making candles, and in many of the nicer arts and manufactures, where wax is required.

Sealing-Wax is made in the following manner: Take one pound of bees wax; three ounces of fine turpentine; olive-oil, and rosin, finely powdered, of each one ounce: when they are well melted, and the dross taken off, put in an ounce and a half of vermilion, or red-lead, finely ground, and stir them together till they are well incorporated: and when this mixture grows a little cool, roll it into sticks, or in any other form. If you would have it black, instead of vermilion, or red-lead, put in lamp-black. The soft, red, and green-wax, used in large seals to some of our law-writings, are thus made: Melt bees-wax over a gentle heat, with such a proportion of Venice turpentine as, when cold, will give it the due consistence: this is determined by repeated trials, first putting in but little turpentine, and afterwards more and more, till by dropping a piece upon a marble to cool, it is found of the true consistence. They then colour it with red-lead, or vermilion, or with verditer, or whatever colours they please, the mixture in this state receiving any.

WAX work, the representation of the faces, *&c.* of persons living or dead; made by applying plaster of Paris in a kind of paste, and thus forming a mould containing the exact representation of the features. Into this mould melted wax is poured, and thus a kind of masks are formed; which being painted and set with glass eyes, and the figures dressed in their proper habits, they bear such a resemblance that it is difficult to distinguish between the copy and the original.

WAY, a passage or road.

The Roman ways are divided into consular, prætorian, military, and public; and of these we have four remarkable ones in England: the first, Watling-street, or Watheling-street, leading from Dover to London, Dunstable, Toucester, Atterston, and the Severn, extending as far as Anglesea in Wales. The second, called Hikenild, or Ikenild-street, stretches from Southampton over the river Isis at Newbridge; thence by Camden and Litchfield; then passes the Derwent, near Derby, and ends at Tinmouth. The third, called Fosse-way, because in some places it was never perfected, but lies as a large ditch, leads from Cornwal through Devonshire, by Tethbury, near Stow in the Wolds; and beside Coventry to Leicester, Newark, and so to Lincoln. The fourth, called Erming, or Erminage-street, extends from St. David's, in Wales, to Southampton.

Way *of a ship*, is sometimes the same as her rake, or run forward or backward: but this term is most commonly understood of her sailing.

Way-wode, a title given to the governors of the chief places in the empire of Muscovy, as also in Poland.

WEAR, or Weer, a great stank or dam in a river, fitted for the taking of fish, or for conveying the stream to a mill.

New wears are not to be made, or others altered, to the nusance of the public, under a certain penalty.

WEASEL, in zoology. See Mustela.

WEATHER, the state or disposition of the atmosphere with regard to heat, cold, wind, rain, frost, *&c.*

As it is in the atmosphere that all plants and animals live, and as that appears to be the great principle of most animal and vegetable productions, alterations, *&c.* there does not seem any thing, in all philosophy, of more immediate concernment to us than the state of the weather, and a knowledge of the great influence it has on our bodies. What vast, but regular, alterations a little turn of weather makes in a tube filled with mercury, or spirits of wine, or in a piece of string, *&c.* every body knows, in the common instance of barometers, thermometers, *&c.* and it is owing partly to our inattention, and partly to our unequal and intemperate course of living, that we do not feel as great and regular ones in the tubes, chords, and fibres of our own bodies.

Weather-cock, a moveable vane in form of a cock, or other shape, placed on high, to be turned round accordding to the direction of the wind, and point out what quarter the wind blows from,

Weather-glasses. See Barometer, and Thermometer.

WEATHERING, among sailors, signifies the doubling, or sailing by a head land, or other place.

WEAVING, the art of working a web of cloth, silk, or other stuff, in a loom with a shuttle. For the manner of performing which, see Cloth.

WEB, a sort of tissue or texture formed of threads interwoven with each other; some whereof are extended in length, and called the warp; and others drawn across, and called the woof. See Cloth.

Spider's Web. See Aranea.

WEDGE, one of the mechanical powers. See Mechanics.

WEDNESDAY, the fourth day of the week, so called from a Saxon idol named Woden, supposed to be Mars, worshipped on this day.

Ash-Wednesday, the first day of Lent, so called from the custom observed in the ancient christian church of penitents expressing their humiliation at this time, by appearing in sackcloth and ashes.

WEED, a common name for all rank and wild herbs, that grow of themselves, to the detriment of other useful herbs they grow among.

Weed, in the miners language, denotes the degeneracy of a load or vein of fine metal into an useless marcasite.

WEEK, in chronology, a division of time comprising seven days. See Astronomy, p. 489.

The origin of this division of weeks, or of computing time by sevenths, is greatly controverted. Some will have it to take its rise from the four quarters or intervals of the moon, between her changes or phases, which, being about seven days distant, gave occasion to the division.

Be this as it will, the division is certainly very ancient. The Syrians, Egyptians, and most of the oriental nations, appear to have used it from all antiquity: though it did not get footing in the west till Christianity brought it in: the Romans reckoned their days not by sevenths, but by ninths, and the ancient Greeks by decads or tenths.

Indeed, the Jews divided their time by weeks, but it was upon a different principle from the eastern nations.

God

God himself appointing them to work six days, and to rest the sabbath, in order to keep up the sense and remembrance of the creation; which being effected in six days, he rested the seventh.

Passion Week, or the *Holy* Week, is the last week in Lent, wherein the church celebrates the mystery of our Saviour's death and passion.

Week, or Wyck, in geography, a parliament and port-town of Scotland, in the shire of Cathness: W. long. 2° 45′, N. lat. 58° 40′.

WEEVER, in ichthyology. See Trachinus.

WEIGH, a weight of cheese, wool, *&c.* containing 256 pounds avoirdupoise. Of corn, the weigh contains forty bushels; of barley or malt, six quarters. In some places, as Essex, the weigh of cheese is 300 pounds

WEIGHING, the act of examining a body in the balance to find its weight.

Weighing-anchor, is the drawing it out of the ground it had been cast into, in order to set sail, or quit a port, road, or the like.

WEIGHT, in physics, a quality in natural bodies whereby they tend downwards, towards the centre of the earth. Or, weight may be defined, in a less limited manner, to be a power inherent in all bodies whereby they tend to some common point, called the centre of gravity; and that with a greater or less velocity, as they are more or less dense, or as the medium they pass thro' is more or less rare. See Mechanics.

Weight, in commerce, denotes a body of a known weight, appointed to be put in the balance against other bodies whose weight is required.

WEIL, or Weyl, an imperial city of Germany, in the circle of Swabia, and duchy of Wirtemburg: E. long. 8° 40′, N. lat. 48° 40′.

WEIMAR, a city of Germany, in the circle of Upper Saxony, the capital of the Weimar: E. long. 11° 25′, N. lat. 51°.

WEISEL, a river of Poland, and the same with the vistula. See Vistula.

WEISSENBURG, or Stulweissenburg, a city of Lower Hungary, situated near the east end of the Platten sea, thirty-six miles south-west of Buda.

WEISSENFELD, a town of Germany, in the circle of Upper Saxony, and marquisate of Misnia, seventeen miles south-west of Leipsick.

WELCHPOLE, a market-town of Montgomeryshire, situated six miles north of Montgomery.

WELD, or Wold, in botany. See Reseda.

WELDING heat, in smithery, a degree of heat given to iron, *&c.* sufficient only for bending, or doubling it up.

WELL, a hole under ground, usually of a cylindrical figure, and walled with stone and mortar: its use is to collect the water of the strata around it.

Well, in the military art, a depth which the miner sinks under ground with branches or galleries running out from it; either to prepare a mine, or to discover and disappoint the enemies mine.

Well hole, in building, is the hole left in a floor for the stairs to come up through.

WELLS, a city of Somersetshire, situated sixteen miles south west of the city of Bath, both which cities have but one bishop.

This is also the name of a town of Germany, in the circle of Austria, situated eleven miles south of Linez.

WELLAND, a river which rising in Leicestershire, and running eastward between the counties of Rutland and Northampton, and afterwards north-east by Stamford, falls into a bay of the German Sea, which divides the counties of Lincoln and Norfolk.

WELLINBOROUGH, a market-town of Northamptonshire, situated on the river Nen, ten miles north-east of Northampton.

WELLINGTON, a market-town of Shropshire, situated ten miles east of Shrewsbury.

WEM, a market-town of Shropshire, situated eight miles north of Shrewsbury.

WEN, a tumour or excrescence that arises on different parts of the body, and contains a cystus or bag filled with some peculiar matter.

WENDOVER, a borough town of Bucks, six miles south of Ailesbury; which sends two members to parliament.

WENER, a lake in Sweden, in the province of Gothland, seventy miles in length, and fifty in breadth.

WENLOCK, a borough-town of Shropshire, ten miles south-east of Shrewsbury; which sends two members to parliament.

WENSUSSEL, the north division of Jutland, in Denmark, having the Categate sea on the north, the Schaggerrack sea on the east, the province of Wiburg on the south, and the German Sea on the west.

WEOBLEY, a borough-town of Herefordshire; 12 miles north-west of Hereford; which sends two members to parliament.

WERMELAND, a province of Sweden, lying between the province of Dalecarlia on the north, and the lake Wener on the south.

WESEL, a city of Germany, in the duchy of Cleves: E. long. 6° 5′, N. lat. 51° 37′.

WESER, a river of Germany, which rises in the Landgravate of Hesse, runs between the circles of Westphalia and Lower Saxony, and falls into the German sea below Carlstat.

WEST, one of the cardinal points of the horizon, diametrically opposite to the east; and strictly defined, the intersection of the prime vertical with the horizon, on that side the sun sets in.

WESTRURY, a borough-town of Wiltshire, twenty miles north-west of Salisbury; which sends two members to parliament.

WESTLOW, a borough town of Cornwal, twenty-three miles south-west of Launceston; which sends two members to parliament.

WESTMANIA, a province of Sweden, having Upland on the east, and Wermeland on the west.

WESTMEATH, a county of Ireland, in the province of Leinster, bounded by Longford and Cavan on the north; by Eastmeath, on the east; by King's County, on the south; and by the river Shannon, which divides it from Roscommon, on the west

WESTMINSTER, a city which forms the west part of the town which goes by the general name of London; but is under a distinct government; the dean and chapter appointing the high steward, high bailiff, and other officers, who have the government of the city. Here are the king's palaces, and the houses of most of the nobility,

bility, the high court of parliament, and the ſupreme courts of juſtice; but there is no biſhop of this city It elects two members of parliament.

WESTMORELAND, an Engliſh county, bounded by Cumberland on the north, by Yorkſhire on the eaſt, by Lancaſhire on the ſouth, and by the Iriſh channel on the weſt.

WESTPHALIA, the north-weſt circle of the empire of Germany; bounded by the German ocean, on the north; by the circle of Lower Saxony, on the eaſt; by the Landgravate of Heſſe, the Palatinate of the Rhine, and the electorate of Triers, on the ſouth; and by the Netherlands, on the weſt: being 200 miles in length, and from 150 to 200 in breadth.

WESTRAM, a market-town of Kent, under the meridian of London, 44 miles weſt of Canterbury

WETTERAVIA, the ſouthern diviſion of the Landgravate of Heſſe, in Germany, lying along the northern bank of the river Maine, comprehending the counties of Hanau and Naſſau.

WETZLAR, an imperial city of Germany, in the circle of the Upper Rhine and territory of Wetteravia ſituated on the river Lohn, E. long. 8° 15′, N. lat 50° 30′.

WEXFORD, a county of Ireland, in the province of Munſter, bounded by the county of Wicklow on the north, by the ocean on the eaſt and ſouth, and by Kilkenny and Waterford on the weſt.

Wexford, the capital of this county, is ſituated at the mouth of the river Slaney, ſixty five miles ſouth of Dublin.

WEYMOUTH, a port-town of Dorſetſhire, ſituated on a fine bay of the Engliſh channel ſeven miles ſouth of Dorcheſter. It ſends two members to parliament.

WHALE, in ichthyology. See BALÆNA, and PHYSETER

WHARF, a ſpace on the banks of a haven, creek, or hithe, provided for the convenient loading and unloading of veſſels upon.

WHEAT, in botany. See TRITICUM. For the culture of wheat, ſee AGRICULTURE, p. 60.

WHEEL, in mechanics, a ſimple machine, conſiſting of a round piece of wood, metal, or other matter, which revolves on an axis. See MECHANICS.

WHELP, the young of a dog, fox, lion, or any wild beaſt.

WHELPS, in a ſhip, the ſeaman's term for thoſe brackets which are ſet up on the capſtan cloſe under the bars; they give the ſweep to it, and are ſo contrived that the cable winding about them may not ſurge ſo much as it might otherwiſe do if the body of the capſtan were quite round and ſmooth.

WHETSTONE, a ſtone which ſerves for the whetting of knives and other tools upon.

WHEY, the ſerum, or watery part, of milk. See WHEY.

WHIG, a party in Britain, oppoſite to the tories, from whom they differ chiefly in their political principles. See TORIES.

The names of whig and tory were not known till about the middle of the reign of Charles II. when theſe were given as party-diſtinctions. Theſe parties may be conſidered either with regard to the ſtate, or to religion The ſtate tories are either violent, or moderate: the firſt would have the king to be abſolute, and therefore plead for paſſive obedience, non-reſiſtance, and the hereditary right of the houſe of Steuart. The moderate tories would not ſuffer the king to loſe any of his pererogative; but then they would not ſacrifice thoſe of the people. The ſtate whigs are either ſtrong republicans, or moderate ones The firſt, ſays Rapin, are the remains of the party of the long parliment, who attempted to change monarchy to a commonwealth: but theſe make ſo ſlender a figure, that they only ſerve to ſtrengthen the party of the other whigs. The tories would perſuade the world, that all the whigs are of this kind; as the whigs would make us believe that all the tories are violent. The moderate ſtate-whigs are much in the ſame ſentiments with the moderate tories and deſire that the government may be maintained on the ancient foundation: all the difference is, that the firſt bear a little more to the parliament and people, and the latter to that of the king. In ſhort, the old whigs were always jealous of the encroachments of the royal prerogative, and watchful over the preſervation of the liberties and properties of the people.

WHIP, or WHIP-STAFF, in a ſhip, a piece of timber, in form of a ſtrong ſtaff, faſtened into the helm, for the ſteerſman, in ſmall ſhips, to hold in his hand, in order to move the rudder and direct the ſhip.

WHIRLPOOL an eddy, vortex, or gulph, where the water is continually turning round

Theſe in rivers are very common, from various accidents, and are uſually very trivial, and of little conſequence. In the ſea they are more rare, but more dangerous. Sibbald has related the effects of a very remarkable marine whirlpool among the Orcades, which would prove very dangerous to ſtrangers, though it is of no conſequence to the people who are uſed to it. This is not fixed to any particular place, but appears in various part of the limits of the ſea among thoſe iſlands. Wherever it appears, it is very furious; and boats, &c. would inevitably be drawn in and periſh with it; but the people who navigate them are prepared for it, and always carry an empty veſſel, a log of wood, or large bundle of ſtraw, or ſome ſuch thing, in the boat with them; as ſoon as they perceive the whirlpool, they toſs this within its vortex, keeping themſelves out: this ſubſtance, whatever it be, is immediately received into the centre, and carried under water; and as ſoon as this is done, the ſurface of the place where the whirlpool was becomes ſmooth, and they row over it with ſafety; and in about an hour they ſee the vortex begin again in ſome other place, uſually at about a mile's diſtance from the firſt.

WHIRLWIND, a wind that riſes ſuddenly is exceeding rapid and impetuous when riſen, but is ſoon ſpent. See PNEUMATICS, p. 495.

WHISPERING. See the articles HEARING, ATTENTION, &c.

WHISPERING PLACES depend upon this principle. If the vibrations of the tremulous body are propagated through a long tube, they will be continually reverberated from the ſides of the tube into its axis and by that means prevented from ſpreading, till they get out of it; whereby they will be exceedingly increaſed, and the ſound rendered much louder than it would otherwiſe be.

Hence it is that ſound is conveyed from one ſide of a whiſpering gallery to the oppoſite one, without being perceived by thoſe who ſtand in the middle.

WHIST,

WHIST, a well-known game at cards; fo called from the filence obferved during the play.

WHITBY, a port-town of the north riding of Yorkfhire, fituated on the German fea, thirty-eight miles north-eaft of York.

WHITCHURCH, a borough-town of Hampfhire, fituated ten miles north of Winchefter. It fends two members to parliament.

WHITE, one of the colours of natural bodies.

WHITE *of the eye*, denotes the firft tunic or coat of the eye, called albuginea. See ANATOMY, p. 289.

WHITE FRIERS, a name common to feveral orders of monks, from their being clothed in a white habit.

WHITE-HORSE, in ichthyology. See RAIA.

WHITE LEAD. See CERUSE.

WHITE-SEA, in geography, a bay of the frozen ocean, in the north of Mufcovy, between Ruffian Lapland and Samoieda.

WHITE-WINE, wine of a bright tranfparent colour, bordering on white, thus called to diftinguifh it from the red wines. See WINE.

WHITEHAVEN, a port-town of Cumberland, fituated on the Irifh channel: W. long. 3° 16′, N. lat. 54° 30′.

WHITENESS, the quality which denominates a body white.

WHITING, in ichthyology. See GADUS.

WHITES, in medicine, the fame with fluor albus. See MEDICINE, p. 164.

WHITSUNDAY, a folemn feftival of the Chriftian church, obferved on the fiftieth day after Eafter, in memory of the defcent of the Holy Ghoft upon the apoftles in the vifible appearance of fiery cloven tongues, and of thofe miraculous powers which were then conferred upon them.

It is called Whitfunday, or White Sunday, becaufe this being one of the ftated times for baptifm in the ancient church, thofe who were baptifed put on white garments, as types of that fpiritual purity they received in baptifm. As the defcent of the Holy Ghoft upon the apoftles happened upon the day which the Jews called pentecoft, this feftival retained the name of pentecoft among the Chriftians

W BURG, the capital of the territory of the fame name in Jutland: E long. 9° 16′, N. lat 56° 20′.

WIBURG, a city and port-town of Ruffian Finland, fituated on the gulph of Finland: E long. 29°, N. lat 61°.

WICCOMB CHIPPING, a borough-town of Bucks, twelve miles fouth of Ailefbury. It fends two members to parliament.

WICK DE DUERSTEDE, a town of the United Netherlands, in the province of Utrecht, fifteen miles fouth-eaft of the city of Utrecht.

WICKER, a twig of the ofier fhrub, fingle or wrought.

WICKET, a fmall door in the gate of a fortified place, *&c.* or a hole in a door, through which to view what paffes without.

WICKLIFFISTS, or WICKLIFFITES, a religious fect which fprung up in England in the reign of Edward III. and took its name from John Wickliff, doctor and profeffor of divinity in the univerfity of Oxford, who maintained that the fubftance of the facramental bread and wine remained unaltered after confecration; and oppofed the doctrine of purgatory, indulgences, auricular confeffion, the invocation of faints, and the worfhip of images. He maintained, that the children of the religious may be faved without being baptized; that priefts may adminifter confirmation; that there ought to be only two orders in the church, that of priefts, and that of deacons. He made an Englifh verfion of the Bible; and compofed two volumes, called Aletheia, that is, Truth, from which John Huffe learned moft of his doctrines. In fhort, to this reformer we owe the firft hint of the reformation, which was effected about two hundred years after.

WICKLOW, a county of Ireland, in the province of Leinfter, bounded by the county of Dublin on the north, by the Irifh channel on the eaft, by Wexford on the fouth, and by Kildare and Katerlagh on the weft.

WICKWARE, a market town of Gloceftershire, fituated twenty miles fouth of Glocefter.

WIDGEON, in ornithology. See ANAS.

WIDOW, a woman who has loft her hufband.

WIFE, a married woman, or one joined with, and under the protection of, an hufband. See HUSBAND.

WIGGAN, a borough-town of Lancafhire, twenty nine miles fouth of Lancafter. It fends two members to parliament.

Ifle of WIGHT, part of the county of Southampton, and feparated from it by a narrow channel, is about twenty miles long, and twelve broad. The chief town is Newport.

WIGTOWN, a borough and port-town of Scotland, in the fhire of Galloway, fituated on a bay of the Irifh channel, ninety miles fouth-weft of Edinburgh.

WILDERNESS, in gardening, a kind of grove of large trees, in a fpacious garden, in which the walks are commonly made either to interfect each other in angles, or have the appearance of meanders and labyrinths

WILKOMERS, a city of Poland, in the dutchy of Lithuania: E. long. 25°, N lat. 55° 30′.

WILL, or *laft* WILL, in law, fignifies the declaration of a man's mind and intent relating to the difpofition of his lands, goods, or other eftate, or of what he would have done after his death.

In the common law, there is a diftinction made between a will and a teftament; as that is called a will, where lands or tenaments are given; and when the difpofition concerns goods and chattels alone, it is termed a teftament. See TESTAMENT.

WILL-*with-a-wifp*, or *Jack-with-a-lanthorn*, a meteor known among the people under thefe names, but more ufually among authors under that of ignis fatuus.

This meteor is chiefly feen in fummer-nights, frequenting meadows, marfhes, and other moift places. It feems to arife from a vifcous exhalation, which being kindled in the air, reflects a fort of thin flame in the dark, without any fenfible heat.

It is often found flying along rivers, hedges, *&c.* by reafon it there meets with a ftream of air to direct it. The ignus fatuus, fays Sir Ifaac Newton, is a vapour fhining without heat; and there is the fame difference between this vapour and flame, as between rotten wood fhining without heat and burning coals of fire.

WILLIAMSBURG, capital of the colony of Virginia, fituated in James-county, between James-river and York-river: W. long. 76° 30′, N. lat. 37° 20′.

WILLIAM's FORT, a fort belonging to the Englifh Eaft-India

India company, ſituated on the weſtern branch of the river Ganges, in the province of Bengal: E. long. 87°, N. lat. 2-° 45′.

WILLIAMSTAT, a port-town of Holland, ſituated on the ſea called Hollands-Deep, fourteen miles ſouth of Rotterdam.

WILLOW, in botany. See SALIX.

WILNA, a city of Poland, capital of the great duchy of Lithuania, ſituated on a river of the ſame name: E. long. 25° 15′, N. lat. 55°.

WILTON, a borough-town of Wiltſhire, ſituated on the river Willey, ſix miles north-weſt of Saliſbury. It ſends two members to parliament.

WILTSHIRE, a county of England, bounded by Gloceſterſhire and Oxfordſhire on the north, by Berkſhire and Hampſhire on the eaſt, by Dorſetſhire on the ſouth, and by Somerſetſhire on the weſt.

WINCHELSEA, a borough and port-town of Suſſex, ſituated on a bay of the Engliſh channel, thirty miles eaſt of Lewes. It ſends two members to parliament.

WINCHESTER, the capital city of Hampſhire, ſituated on the river Itching, ſixty-five miles ſouth-weſt of London.

WIND. See PNEUMATICS, p. 495.

WIND-MILL, a kind of mill, the internal parts of which are much the ſame with thoſe of a water-mill; from which however it differs, in being moved by the impulſe of the wind upon its vanes, or ſails, which are to be conſidered as a wheel on the axle. See MECHANICS.

WIND-FLOWER, in botany. See ANEMONE.

WIND-GALL, a name given by our farriers to a diſtemperature of horſes. See FARRIERY, p. 575.

WIND-SAILS, in a ſhip, are made of the common ſail-cloth, and are uſually between twenty-five and thirty feet long, according to the ſize of the ſhip, and are of the form of a cone ending obtuſely: when they are made uſe of, they are hoiſted by ropes to about two thirds or more of their height, with their baſis diſtended circularly by hoops, and their apex hanging downwards in the hatch ways of the ſhip; above each of theſe, one of the common ſails is ſo diſpoſed, that the greateſt part of the air ruſhing againſt it, is directed into the wind-ſail, and conveyed, as through a funnel, into the upper parts of the body of the ſhip.

WIND TACKLE-BLOCKS, in a ſhip, are the main double blocks which being made faſt to the end of a ſmall cable, ſerve for hoiſting of goods into the ſhip, *&c.*

To WIND, or WEND *a ſhip*, ſignifies to bring her head about. *How winds or wends the ſhip?* is a queſtion aſked by mariners, concerning a ſhip under ſail; ſignifying as much as, upon what point of the compaſs does ſhe lie with her head?

WINDWARD, in the ſea-language, denotes any thing towards that point from whence the wind blows, in reſpect of a ſhip: thus windward-tide, is the tide which runs againſt the wind.

WINDAGE *of a gun*, the difference between the diameter of the bore, and the diameter of the ball.

WINDLASS, a machine uſed to raiſe huge weights withal, as guns, ſtones, anchors, *&c.*

It is very ſimple, conſiſting only of an axis, or roller, ſupported horizontally at the two ends, by two pieces of wood and a pully: the two pieces of wood meet at top, being placed diagonally ſo as to prop each other; the axis, or roller, goes through the two pieces, and turns in them. The pully is faſtened at top where the pieces join. Laſtly, there are two ſtaves or handſpikes which go through the roller, whereby it is turned, and the rope which comes over the pulley is wound off and on the ſame.

WINDLASS, in a ſhip, is an inſtrument in ſmall ſhips, placed upon the deck, juſt abaft the fore maſt. It is made of a piece of timber ſix or eight feet ſquare, in form of an axle-tree, whoſe length is placed horizontally upon two pieces of wood at the ends thereof, and upon which it is turned about by the help of handſpikes put into holes made for that purpoſe. This inſtrument ſerves for weighing anchors, or hoiſting of any weight in or out of the ſhip, and will purchaſe much more than any capſtan, and that without any danger to thoſe that heave; for if in heaving the windlaſs about, any of the handſpikes ſhould happen to break, the windlaſs would pall of itſelf.

WINDOW, an aperture or open place in the wall of a houſe, to let in the wind and light. See ARCHITECTURE, p. 357.

WINDSOR, a borough-town of Berkſhire, twenty miles weſt of London, moſt remarkable for the magnificent palace or caſtle ſituated there on an eminence, which commands the adjacent country for many miles, the river Thames running at the foot of the hill. The knights of the garter are inſtalled in the royal chapel here. It ſends two members to parliament.

WINE, a briſk, agreeable, ſpirituous and cordial liquor, drawn from vegetable bodies, and fermented.

All ſorts of vegetables, fruits, ſeeds, roots, *&c.* afford wine; as grapes, currants, mulberries, elder-berries, cherries, apples, pulſe, beans, peaſe, turneps, radiſhes, and even graſs itſelf. Hence under the claſs of wines, or vinous liquors, come not only wines abſolutely ſo called, but alſo ale, cyder, *&c.* See BREWING, and CHEMISTRY, p. 95, 161.

Wine in France is diſtinguiſhed, from the ſeveral degrees and ſteps of its preparation, into, 1. *Mere goutte*, mother-drop, which is the virgin wine, or that which runs of itſelf out at the top of the vat wherein the grapes are laid, before the vintager enters to tread or ſtamp the grapes. 2. Muſt, ſurmuſt, or ſtum, which is the wine or liquor in the vat, after the grapes have been trod or ſtamped. 3. Preſſed wine, being that ſqueezed with a preſs out of the grapes half bruiſed by the treading. The huſks left of the grapes are called rope, murk, or mark; by throwing water upon which and preſſing them afreſh, they make a liquor for ſervants uſe, anſwerable to our cyderkin, and called *boiſſon*. 4. Sweet wine, is that which has not yet worked nor fermented. 5. Bouru, that which has been prevented working by caſting in cold water. 6. Worked wine, that which has been let work in the vat, to give it a colour. 7. Boiled wine, that which has had a boiling before it worked, and which by that means ſtill retains its native ſweetneſs. 8. Strained wine, that made by ſteeping dry grapes in water, and letting it ferment of itſelf. Wines are alſo diſtinguiſhed with regard to their colour into white wine, red wine, claret wine, pale wine, roſe, or black wine; and with regard to their country, or the ſoil that produces them, into French wines, Spaniſh wines, Rheniſh wines, Hungary wines, Greek wines, Canary wines, *&c.* and more

particularly

particularly into Port wine, Madeira wine, Burgundy wine, Champain wine, Falernian wine, Tockay wine, Schiras wine, *&c.*

Spirit of Wine. See Chemistry, p. 163.

WING, that part of a bird, insect, *&c.* whereby it is enabled to fly. See Natural History.

Wings, in heraldry, are borne sometimes single, sometimes in pairs; in which case, they are called conjoined When the points are downward, they are said to be inverted; when up, elevated.

Wings, in military affairs, are the two flanks or extremes of an army, ranged in form of a battle; being the right and left sides thereof.

Wings, in fortification, denote the longer sides of horn-works, crown-works, tenailles, and the like out-works; including the ramparts and parapets; with which they are bounded on the right and left, from their gorge to their front.

WINSLOW, a market-town of Bucks, six miles north of Ailesbury.

WINSTER, a market-town of Darbyshire, situated ten miles north of Darby.

WINTER, one of the four seasons or quarters of the year. See Astronomy, p. 546.

Winter's Bark, in botany, a name given to the bark of the white or wild cinnamon tree. See Cinnamon.

WINTERTONNESSE, the north cape of the county of Norfolk, four miles north of Yarmouth.

WIRE, a piece of metal drawn through the hole of an iron into a thread of a fineness answerable to the hole it passed through.

Wires are frequently drawn so fine, as to be wrought along with other threads of silk, wool, flax, *&c.*

The metals most commonly drawn into wire, are gold, silver, copper, and iron. Gold-wire is made of cylindrical ingots of silver, covered over with a skin of gold, and thus drawn successively through a vast number of holes, each smaller and smaller, till at last it is brought to a fineness exceeding that of a hair. That admirable ductility which makes one of the distinguishing characters of gold, is no where more conspicuous than in this gilt wire. A cylinder of forty-eight ounces of silver, covered with a coat of gold, only weighing one ounce, as Dr. Halley informs us, is usually drawn into a wire, two yards of which weigh no more than one grain; whence ninety-eight yards of the wire weigh no more than forty-nine grains, and one single grain of gold covers the ninety-eight yards; so that the ten thousandth part of a grain is above one-eighth of an inch long.

Wire *of Lapland.* The inhabitants of Lapland have a sort of shining slender substance in use among them on several occasions which is much of the thickness and appearance of our silver-wire, and is therefore called, by those who do not examine its structure or substance, Lapland-wire. It is made of the sinews of the rein-deer, which being carefully separated in the eating, are, by the women, after soaking in water, and beating, spun into a sort of thread, of admirable fineness, and strength, when wrought to the smallest filaments; but when larger, is very strong, and fit for the purposes of strength and force. Their wire, as it is called, is made of the finest of these threads, covered with tin. The women do this business, and the way they take is to melt a piece of tin; and placing at the edge of it a horn with a hole through it, they draw these sinewy threads, covered with the tin, through the hole, which prevents their coming out too thick covered. This drawing is performed with their teeth; and there is a small piece of bone placed at the top of the hole, where the wire is made flat, so that we always find it rounded on all sides but one, where it is flat.

This wire they use in embroidering their cloaths as we do gold and silver; they often sell it to strangers, under the notion of its having certain magical virtues.

WIRKSWORTH a market-town of Darbyshire, situated six miles north of Darby.

WISBEACH, a market-town of the isle of Ely, in Cambridgeshire, situated fifteen miles north of Ely.

WISDOM, usually denotes a higher and more refined notion of things immediately presented to the mind, as it were, by intuition without the assistance of ratiocination.

WISTON, a market-town of Pembrokeshire, situated ten miles north of Pembroke.

WIT is a quality of certain thoughts and expressions: the term is never applied to an action nor to a passion, and as little to an external object.

However difficult it may be, in every particular instance, to distinguish a witty thought or expression from one that is not so; yet in general it may be laid down, that the term *wit* is appropriated to such thoughts and expressions as are ludicrous, and also occasion some degree of surprise by their singularity. Wit also, in a figurative sense, expresses that talent which some men have of inventing ludicrous thoughts or expressions: we say commonly, *a witty man*, or *a man of wit*.

Wit in its proper sense, as explained above, is distinguishable into two kinds; wit in the thought, and wit in the words or expression. Again, wit in the thought is of two kinds; ludicrous images, and ludicrous combinations of things that have little or no natural relation.

Ludicrous images that occasion surprise by their singularity, as having little or no foundation in nature, are fabricated by the imagination: and the imagination is well qualified for the office; being of all our faculties the most active, and the least under restraint. Take the following example.

> *Shylock.* You knew (none so well, none so well as you) of my daughter's flight.
>
> *Salino.* That's certain: I, for my part, knew the tailor that made the wings she flew withal.
>
> *Merchant of Venice, act 3. sc. 1.*

The image here is undoubtedly witty. It is ludicrous: and it must occasion surprise; for having no natural foundation, it is altogether unexpected.

The other branch of wit in the thought, is that only which is taken notice of by Addison, following Locke, who defines it "to lie in the assemblage of ideas; and putting those together, with quickness and variety, wherein can be found any resemblance or congruity, thereby to make up pleasant pictures and agreeable visions in the fancy." It may be defined more curtly, and perhaps more accurately, "a junction of things by distant and fanciful relations, which surprise because they are unexpected." The following is a proper example.

> We grant although he had much wit,
> H' was very shy of using it,

As being loth to wear it out;
And therefore bore it not about,
Unless on holidays, or so,
As men their best apparel do.

Hudibras, canto 1.

Wit is of all the most elegant recreation: the image enters the mind with gaiety, and gives a sudden flash which is extremely pleasant. Wit thereby gently elevates without straining, raises mirth without dissoluteness, and relaxes while it entertains.

Wit in the expression, commonly called *a play of words*, being a bastard sort of wit, is reserved for the last place. We proceed to examples of wit in the thought; and first of ludicrous images.

Falstaff, speaking of his taking Sir John Colevile of the Dale:

Here he is, and here I yield him; and I beseech your Grace, let it be book'd with the rest of this day's deeds; or, by the Lord, I will have it in a particular ballad else, with mine own picture on the top of it, Colevile kissing my foot: to the which course if I be enforced, if you do not all shew like gilt twopences to me; and I, in the clear sky of fame, o'ershine you as much as the full moon doth the cinders of the element, which shew like pins' heads to her; believe not the word of the noble. Therefore let me have right, and let desert mount.

Second Part, Henry IV. *act* 4. *sc.* 6.

I knew, when seven justices could not take up a quarrel, but when the parties were met themselves, one of them thought but of an *if*; as, if you had said so, then I said so; and they shook hands, and swore brothers. Your *if* is the only peace-maker; much virtue is in *if*.

Shakespear.

For there is not through all nature another so callous and insensible a member as the world's posteriors, whether you apply to it the toe or the birch.

Preface to a Tale of a Tub.

The other branch of wit in the thought, *viz.* ludicrous combinations and oppositions, may be traced through various ramifications. And, first, fanciful causes assigned that have no natural relation to the effects produced:

Lancaster. Fare you well, Falstaff; I, in my condition, Shall better speak of you than you deserve. [*Exit.*

Falstaff. I would you had but the wit; 'twere better than your dukedom. Good faith, this same young sober-blooded boy doth not love me; nor a man cannot make him laugh; but that's no marvel, he drinks no wine. There's never any of these demure boys come to any proof; for thin drink doth so overcool their blood, and making many fish-meals, that they fall into a kind of male green-sickness; and then, when they marry, they get wenches. They are generally fools and cowards; which some of us should be too, but for inflammation. A good sherris-sack hath a twofold operation in it: it ascends me into the brain; dries me there all the foolish, dull, and crudy vapours which environ it; make it apprehensive, quick, forgetive, full of nimble, fiery, and delectable shapes; which delivered o'er to the voice, the tongue, which is the birth, becomes excellent wit The second property of your excellent sherris is, the warming of the blood; which before cold and settled, left the liver white and pale; which is the badge of pusillanimity and cowardice: but the sherris warms it, and makes it course from the inwards to the parts extreme; it illuminateth the face, which, as a beacon, gives warning to all the rest of this little kingdom, man, to arm; and then the vital commoners and inland petty spirits muster me all to their captain, the heart; who, great, and puff'd up with this retinue, doth any deed of courage: and thus valour comes of sherris. So that skill in the weapon is nothing without sack, for that sets it a-work; and learning a mere hoard of gold kept by a devil, till sack commences it, and sets it in act and use. Hereof comes it that Prince Harry is valiant; for the cold blood he did naturally inherit of his father, he hath, like lean, steril, and bare land, manured, husbanded, and till'd with excellent endeavour of drinking good and good store of fertile sherris, that he is become very hot and valiant. If I had a thousand sons, the first human principle I would teach them, should be to forswear thin potations, and to addict themselves to sack.

Second Part of Henry IV. *act* 4. *sc.* 7.

The trenchant blade, toledo trusty,
For want of fighting was grown rusty,
And ate into itself, for lack
Of some body to hew and hack.
The peaceful scabbard where it dwelt
The rancor of its edge had felt:
For of the lower end two handful
It had devoured, t'was so manful;
And so much scorn'd to lurk in case,
As if it durst not shew its face.

Hudibras, canto 1.

To account for effects by such fantastical causes, being highly ludicrous, is quite improper in any serious composition. Therefore the following passage from Cowley, in his poem on the death of Sir Henry Wooton, is in a bad taste.

He did the utmost bounds of knowledge find,
He found them not so large as was his mind.
But, like the brave Pellæan youth, did moan,
Because that art had no more worlds than one.
And when he saw that he through all had past,
He dy'd, lest he should idle grow at last.

Fanciful reasoning:

Falstaff. Imbowell'd!——if thou imbowel me to-day, I'll give you leave to powder me, and eat me to-morrow! S'blood, 'twas time to counterfeit, or that hot termagant Scot had paid me scot and lot too. Counterfeit? I lie, I am no counterfeit: to die is to be a counterfeit; for he is but the counterfeit of a man, who hath not the life of a man; but to counterfeit dying, when a man thereby liveth, is to be no counterfeit, but the true and perfect image of life indeed.

First Part Henry IV. *act* 1. *sc.* 10.

Clown. And the more pity that great folk should have countenance in this world to drown or hang themselves, more than their even Christians.

Hamlet, act 5. *sc.* 2.

Pedro. Will you have me, Lady?

Beatrice. No, my Lord, unless I might have another for working days. Your Grace is too costly to wear every day.

Much ado about nothing, Act 2. *sc.* 5.

Jessica.

Jessica. I ſhall be ſaved by my huſband; he hath made me a Chriſtian.

Launcelot. Truly the more to blame he; we were Chriſtians enough before, e'en as many as could well live by one another: this making of Chriſtians will raiſe the price of hogs; if we grow all to be pork-eaters, we ſhall not have a raſher on the coals for money.

Merchant of Venice, Act 3. *ſc.* 6.

But Hudibras gave him a twitch,
As quick as lightning, in the breech,
Juſt in the place where honour's lodg'd,
As wiſe philoſophers have judg'd;
Becauſe a kick in that part, more
Hurts honour, than deep wounds before.

Hudibras, canto 3.

Ludicrous junction of ſmall things with great, as of equal importance:

This day black omens threat the brighteſt fair
That e'er deſerv'd a watchful ſpirit's care:
Some dire diſaſter, or by force, or ſlight:
But what, or where, the fates have wrapt in night:
Whether the nymph ſhall break Diana's law;
Or ſome frail china jar receive a flaw:
Or ſtain her honour, or her new brocade;
Forget her pray'rs, or miſs a maſquerade;
Or loſe her heart, or necklace, at a ball;
Or whether Heav'n has doom'd that Shock muſt fall.

Rape of the Lock, canto ii. 101.

One ſpeaks the glory of the Britiſh Queen,
And one deſcribes a charming Indian ſcreen.

Ibid. canto iii. 13.

Then flaſh'd the living lightning from her eyes,
And ſcreams of horror rend th'affrighted ſkies.
Not louder ſhrieks to pitying heav'n are caſt,
When huſbands, or when lapdogs, breathe their laſt;
Or when rich china veſſels fall'n from high,
In glittering duſt and painted fragments lie!

Ibid. canto iii. 155.

Not youthful kings in battle ſeiz'd alive,
Not ſcornful virgins who their charms ſurvive,
Not ardent lovers robb'd of all their bliſs,
Not ancient ladies when refus'd a kiſs,
Nor tyrants fierce that unrepenting die,
Nor Cynthia when her manteau's pinn'd awry,
E'er felt ſuch rage, reſentment, and deſpair,
As thou, ſad virgin! for thy raviſh'd hair.

Ibid. canto iv. 3.

Joining things that in appearance are oppoſite. As for example, where Sir Roger de Coverley, in the ſpectator, ſpeaking of his widow,

That he would have given her a coal-pit to have kept her in clean linen; and that her finger ſhould have ſparkled with one hundred of his richeſt acres.

Premiſſes that promiſe much and perform nothing. Cicero upon this article ſays,

Sed ſcitis eſſe notiſſimum ridiculi genus, cum aliud expectamus, aliud dicitur: hic nobiſmetipſis noſter error riſum movet. *De oratore, l.* 2. *c.* 63.

Beatrice.——With a good leg and a good foot, uncle, and money enough in his purſe, ſuch a man would win any woman in the world, if he could get her good will.

Much ado about nothing, Act. 2. *ſc.* 1.

Beatrice. I have a good eye, uncle, I can ſee a church by day-light.

Having diſcuſſed wit in the thought, we proceed to what is verbal only, commonly called *a play of words.* This ſort of wit depends, for the moſt part, upon chuſing a word that hath different ſignifications: by this artifice, hocus-pocus tricks are played in language; and thoughts plain and ſimple take on a very different appearance. Play is neceſſary for man, in order to refreſh him after labour; and accordingly man loves play: he even reliſhes a play of words: and it is happy for us, that words can be employed, not only for uſeful purpoſes, but alſo for our amuſement. This amuſement accordingly, though humble and low, is reliſhed by ſome at all times, and by all at ſome times, in order to unbend the mind.

It is remarkable, that this low ſpecies of wit, has, at one time or other, made a figure in moſt civilized nations, and has gradually gone into diſrepute. So ſoon as a language is formed into a ſyſtem, and the meaning of words is aſcertained with tolerable accuracy, opportunity is afforded for expreſſions, which, by the double meaning of ſome words, give a familiar thought the appearance of being new; and the penetration of the reader or hearer is gratified, in detecting the true ſenſe diſguiſed under the double meaning. That this ſort of wit was in England deemed a reputable amuſement, during the reigns of Eliſabeth and James I is vouched by the works of Shakeſpear, and even by the writings of grave divines. But it cannot have any long endurance: for as language ripens, and the meaning of words is more and more aſcertained, words held to be ſynonymous diminiſh daily; and when thoſe that remain have been more than once employed, the pleaſure vaniſheth with the novelty.

We proceed to examples, which, as in the former caſe, ſhall be diſtributed into different claſſes.

A ſeeming reſemblance from the double meaning of a word:

Beneath this ſtone my wife doth lie;
She's now at reſt, and ſo am I.

A ſeeming contraſt from the ſame cauſe, termed *a verbal antitheſis,* which hath no deſpicable effect in ludicrous ſubjects:

Whilſt Iris his coſmetic waſh would try
To make her bloom revive, and lovers die.
Some aſk for charms, and others philters chuſe,
To gain Corinna, and their quartans loſe.

Diſpenſary, canto 2.

And how frail nymphs, oft, by abortion, aim
To loſe a ſubſtance, to preſerve a name.

Ibid. canto 3.

While nymphs take treats, or aſſignations give.

Rape of the Lock.

Other ſeeming connections from the ſame cauſe:

Will you employ your conqu'ring ſword,
To break a fiddle and your word?

Hudibras, canto 2.

To whom the knight with comely grace
Put off his hat to put his caſe.

Hudibras, part 3. *canto* 3.

Here

Here Britain's ſtateſmen oft the fall foredoom
Of foreign tyrants, and of nymphs at home;
Here thou, great Anna whom three realms obey,
Doſt ſometimes counſel take—and ſometimes tea.

Rape of the Lock, canto 3. *l.* 5.

O'er their quietus where fat judges doſe,
And lull their cough and conſcience to repoſe.

Diſpenſary, canto 1.

Speaking of Prince Eugene:

This general is a great taker of ſnuff as well as of towns.

Pope, Key to the Lock,

Exul mentiſque domuſque.

Metamorphoſes, lib. ix. 409.

A ſeeming oppoſition from the ſame cauſe:

Hic quieſcit qui nunquam quievit.

Again,

So like the chances are of love and war,
That they alone in this diſtinguiſh'd are;
In love the victors from the vanquiſh'd fly,
They fly that wound, and they purſue that die.

Waller.

What new-found witchcraft was in thee,
With thine own cold to kindle me?
Strange art; like him that ſhould deviſe
To make a burning glaſs of ice.

Cowley.

Wit of this kind is unſuitable in a ſerious poem; witneſs the following line in Pope's Elegy to the memory of an unfortunate lady:

Cold is that breaſt which warm'd the world before.

This ſort of writing is finely burleſqued by Swift:

Her hands, the ſofteſt ever felt,
Though cold would burn, though dry would melt.

Strephon and Chloe.

Taking a word in a different ſenſe from what is meant, comes under wit, becauſe it occaſions ſome ſlight degree of ſurpriſe:

Beatrice. I may ſit in a corner, and cry *Heigh ho!* for a huſband.

Pedro Lady Beatrice, I will get you one.

Beatrice. I would rather have one of your father's getting. Hath your Grace ne'er a brother like you? Your father got excellent huſbands, if a maid could come by them.

Much ado about nothing, act 2. *ſc.* 5.

Falſtaff. My honeſt lads, I will tell you what I am about.

Piſtol. Two yards and more.

Falſtaff. No quips now, Piſtol: indeed, I am in the waſte two yards about: but I am now about no waſte; I am about thrift.

Merry Wives of Windſor, act 1. *ſc.* 7.

Lo. Sands.———By your leave, ſweet ladies,
If I chance to talk a little wild, forgive me:
I had it from my father.

Anne bullen. Was he mad, Sir?

Sands. O, very mad, exceeding mad, in love too;
But he would bite none———

K. Henry VIII.

An aſſertion that bears a double meaning, one right, one wrong, but ſo connected with other matters as to direct us to the wrong meaning, is a ſpecies of baſtard wit which is diſtinguiſhed from all others by the name *pun*. For example,

Paris.———Sweet Helen, I muſt woo you
To help unarm our Hector: his ſtubborn buckles,
With theſe your white inchanting fingers touch'd,
Shall more obey, than to the edge of ſteel,
Or force of Greekiſh ſinews; you ſhall do more
Than all the iſland kings, diſarm great Hector

Troilus and Creſſida, act 3. *ſc.* 2:

The pun is in the cloſe. The word *diſarm* has a double meaning: it ſignifies to take off a man's armour, and alſo to ſubdue him in fight. We are directed to the latter ſenſe by the context; but with regard to Helen, the word holds only true in the former ſenſe. We go on with other examples:

Eſſe nihil dicis quicquid petis, improbe Cinna:
Si nil, Cinna, petis, nil tibi, Cinna, nego.

Martial, l. 3. *epigr.* 61.

Chief Juſtice. Well! the truth is, Sir John, you live in great infamy.

Falſtaff. He that buckles him in my belt cannot live in leſs.

Chief Juſtice. Your means are very ſlender, and your waſte is great.

Falſtaff. I would it were otherwiſe: I would my means were greater, and my waſte ſlenderer.

Second part Henry IV. *act* 1. *ſc* 5.

Celia. I pray you bear with me, I can go no further.

Clown. For my part, I had rather bear with you than bear you: yet I ſhould bear no croſs if I did bear you; for I think you have no money in your purſe.

As you like it, act 2. *ſc.* 4.

He that impoſes an oath makes it,
Not he that for convenience takes it.
Then how can any man be ſaid
To break an oath he never made?

Hudibras, part 2. *canto* 2.

The ſeventh ſatire of the firſt book of Horace is purpoſely contrived to introduce at the cloſe a moſt execrable pun. Talking of ſome infamous wretch whoſe name was *Rex Rupilius,*

Perſius exclamat, Per magnos, Brute, deos te
Oro, qui reges conſueris tollere, cur non
Hunc regem jugulas? Operum hoc, mihi crede, tuorum eſt.

Though playing with words is a mark of a mind at eaſe, and diſpoſed to any ſort of amuſement, we muſt not thence conclude that playing with words is always ludicrous. Words are ſo intimately connected with thought, that if the ſubject be really grave, it will not appear ludicrous even in this fantaſtic dreſs. We are, however, far from recommending it in any ſerious performance: on the contrary, the diſcordance between the thought and expreſſion muſt be diſagreeable; witneſs the following ſpecimen.

He

He hath abandoned his physicians, Madam, under whose practices he hath persecuted time with hope; and finds no other advantage in the process, but only the losing of hope by time.

All's well that ends well, act 1. *sc*. 1.

K. Henry. O my poor kingdom, sick with civil blows!
When that my care could not with-hold thy riots,
What wilt thou do when riot is thy care?

Second part K. Henry IV.

If any one shall observe, that there is a third species of wit, different from those mentioned, consisting in sounds merely, we are willing to give it place. And indeed it must be admitted, that many of Hudibras's double rhymes come under the definition of wit given in the beginning of this article: they are ludicrous, and their singularity occasions some degree of surprise. Swift is not less successful than Butler in this sort of wit; witness the following instances: *Goddess—Boddice. Pliny—Nicolini. Iscariots—Chariots. Mitre—Nitre. Dragon—Suffragan.*

A repartee may happen to be witty: but it cannot be considered as a species of wit; because there are many repartees extremely smart, and withal extremely serious. We give the following example. A certain petulant Greek, objecting to Anacharsis that he was a Scythian: True, says Anacharsis, my country disgraces me, but you disgrace your country. This fine turn gives surprise; but it is far from being ludicrous.

WITCHCRAFT, a kind of sorcery, especially in women, in which it is ridiculously supposed that an old woman, by entering into a contract with the devil, is enabled, in many instances, to change the course of nature; to raise winds; perform actions that require more than human strength; and to afflict those who offend them with the sharpest pains, *&c.* In the times of ignorance and superstition, many severe laws were made against witches, by which great numbers of innocent persons, distressed with poverty and age, were brought to a violent death; but these are now happily repealed. See LAW, Tit. xxxiii. 8.

WITENA MOT, or WITENA-GEMOT, among our Saxon ancestors, was a term which literally signified the assembly of the wise men, and was applied to the great council of the nation of latter-days called the parliament.

WITEPSKI, the capital of the palatinate of the same name, in the duchy of Lithuania, in Poland: E. long 30°, N. lat. 56°

WITHAM, a market-town of Essex, ten miles north-east of Chelmsford.

WITHERS of a horse, the juncture of the shoulder-bones at the bottom of the neck and main, towards the upper part of the shoulder.

WITNESS, in law, a person who gives evidence in any cause, and is sworn to speak the truth the whole truth, and nothing but the truth. See LAW, Tit. xxi. 4, *&c.* and Tit. xxxi. 1, *&c.*

WITNEY, a market-town of Oxfordshire, seven miles west of Oxford. Here is the greatest manufacture of blankets in England.

WITTENBURG, a city of Germany, in the circle of Upper Saxony, fifty miles north of Dresden.

WITTLESEYMERE, a lake in the isle of Ely, on the confines of Huntingdonshire, six miles long and three broad.

WIVELSCOMB, a market-town of Somersetshire, situated twenty-seven miles south-west of Wells.

WOAD, in botany. See ISATIS.

WOBURN, a market-town of Bedfordshire, ten miles south of Bedford.

WOLAW, the capital of a duchy of the same name, in Bohemia: E. long. 16° 38′, N. lat. 51° 22′.

WOLF, in zoology. See CANIS.

WOLFEMBUTTLE, a city of Germany, in the circle of lower Saxony, and duchy of Brunswick: E. long. 10° 32′, N. lat. 52° 20′.

WOLFERDYKE, an island of the united Netherlands, in the province of Zealand, situated between the islands of north Beveland and south Beveland.

WOLGA, a large river of Russia, which rising in the north of that empire, runs south-east till it falls into the Caspian sea, about fifty miles below Astracan, after its having run a course of between two and three thousand miles

WOLGAST, a city and port-town of Germany, in the circle of Upper Saxony, and duchy of Pomerania, subject to Sweden: E. long. 14° 5′, N. lat. 54° 12′.

WOLKOWSKA, a city of Poland, in the duchy of Lithuania, and palatinate of Novogrodeck: E. long. 24°, N lat. 53°.

WOLLIN, a town and island of Pomerania, situated in the Baltic sea, at the mouth of the river Oder, subject to the king of Prussia.

WOLODOMIR, the capital of a province of the same name in Russia: E. long. 30° 5′, N. lat. 57° 40′.

WOLOGDA, the capital of a province of the same name in Russia, situated on the river Dwina: E. long. 42° 20′, N. lat 59°.

WOLVERHAMPTON, a market-town of Staffordshire, eleven miles south of Stafford.

WOLVES-TEETH, of an horse, are over-grown grinders, the points of which being higher than the rest, prick his tongue and gums in feeding, so as to hinder his chewing. They are seldom met with in any besides young horses; but if they be not daily worn by chewing, they will grow up even to pierce the roof of the mouth.

WOMAN, the female of man. See HOMO.

WOMB. See ANATOMY, p. 274.

WOOD, a solid substance, whereof the trunks and branches of trees consist.

The wood is all that part of a tree included between the bark and the pith For the structure of he the pith, bark, wood, *&c.* of plants, see AGRICULTURE, p. 40.

WOODBRIDGE, a market-town of Suffolk, situated twenty-six miles south-east of Bury.

WOOD COCK, in ornithology. See SCOLOPAX.

WOOD LOUSE, in zoology. See ONISCUS

WOOD-PECKER, in ornithology. See PICUS.

WOODSTOCK, a borough-town of Oxfordshire, situated seven miles north of Oxford It sends two members to parliament.

WOOF, among manufacturers, the threads which the weavers shoot across with an instrument called the shuttle, See CLOTH

WOOL, the covering of sheep. See OVIS

WOOLWICH, a market-town of Kent, situated on the river Thames, six miles east of London.

WORCESTER, the capital city of worcestershire, situated

ted on the river Severn, 110 miles north-west of London: W. long. 2° 15′, N. lat. 52° 5′.

WORCUM, a town of Holland, situated on the river Waal, twenty-three miles east of Rotterdam. This is also the name of a port-town of the United Netherlands, situated on the province of Friezland, on the Zuyder-sea, twenty miles south-west of Lewarden.

WORD, in language, an articulate sound designed to represent some idea. See GRAMMAR and LANGUAGE.

WORKSOP, a market-town of Nottinghamshire, situated twenty miles north of Nottingham.

WORLD, the assemblage of parts which compose the globe of the earth. See GEOGRAPHY, and ASTRONOMY.

WORMS. See NATURAL HISTORY.

WORMS in medicine. See MEDICINE, p. 160.

Earth-WORM. See LUMBRICUS.

WORM, in gunnery, a screw of iron, to be fixed on the end of a rammer, to pull out the wad of a firelock, carabine, or pistol, being the same with the wad-hook, only the one is more proper for small arms, and the other for cannon.

WORM, in chemistry, is a long, winding, pewter pipe, placed in a tub of water, to cool and condense the vapours in the distillation of spirits.

WORMS, in geography, an imperial city of Germany, in the palatinate of the Rhine: E. long. 8° 5′, N. lat. 49° 38′.

WORMWOOD, in botany. See ARTEMISIA.

WORSTED, a kind of woolen thread, which, in the spinning, is twisted harder than ordinary. It is chiefly used either wove or knit into stockings, caps, gloves, or the like.

WORSTED, a market-town of Norfolk, situated seven miles north of Norwich.

WOTTON, a market-town of Gloucestershire, situated seventeen miles south of Gloucester.

WOTTON BASSET, a borough-town of Wiltshire, twenty five miles north of Salisbury; which sends two members to parliament.

WOUND, in surgery. See SURGERY, p. 643.

WRASSE, or OLD-WIFE, in ichthyology. See LABRUS.

WREATH, in heraldry, a roll of fine linen or silk (like that of a Turkish turbant) consisting of the colours borne in the escutcheon, placed in an atchievement between the helmet and the crest, and immediately supporting the crest.

WREN, in ornithology. See MOTACILLA.

WRESTLING, a kind of combat or engagement between two persons unarmed, body to body, to prove their strength and dexterity, and try which can throw his opponent to the ground. See GAMES, *&c.*

WREXHAM, a market-town of Denbighshire, in Wales, situated twenty-three miles south east of St. Asaph.

WRINTON, a market-town of Somersetshire, situated seven miles north of Wells.

WRIST, in anatomy. See ANATOMY, p. 179.

WRIT, in law, signifies, in general, the king's precept in writing under seal, issuing out of some court, directed to the sheriff, or other officer, and commanding something to be done in relation to a suit or action, or giving commission to have the same done.

WRITING, the art or act of signifying and conveying our ideas to others, by letters, or characters, visible to the eye. See COMPOSITION, GRAMMAR, and LANGUAGE.

WRONG, in a logical sense. See ERROR, FALSEHOOD, TRUTH, *&c.*

WRONG, in a legal sense, the same with injury, or tort.

WRONGOUS *Imprisonment*, in Scots law. See LAW, Tit. xxxiii. 23.

WURTEMBURG, in Germany, is the north part of the circle of Swabia.

WURTZBURG, a city of Germany in the circle of Franconia, capital of the bishopric of that name, situated on the river Maine: in E. long. 9° 50′, N. lat. 49° 46′.

WYE, a market-town of Kent, situated twenty miles south-east of Maidstone.

WYE is also a river of Wales, which, rising on the confines of Cardiganshire, and running south east, divides the counties of Radnor and Brecknock, then crossing Herefordshire it turns south, and falls into the mouth of the Severn at Chepstow.

X.

XACA, a port-town of Sicily in the province of Mazara, forty miles south of Palermo: E. long. 13°, N. lat. 37°.

XALISCO, a city of Mexico, in America, situated near the Pacific ocean, four hundred miles west of the capital city of Mexico: W. long. 110°, and N. lat. 22° 20′.

XANSI, a province of China, bounded by the province of Peking on the east, by the great wall on the north, by the province of Honan on the south, and by the river Crocei, which divides it from the province of Xensi, on the west.

XANTHIUM, in botany, a genus of the monœcia pentandria class. The common calix of the male is imbricated; the corolla is funnel shaped, and divided into five segments; and the receptacle is paleaceous: The calix of the female consists of two leaves, including two flowers; it has no corolla; the drupa is dry, muricated, and divided into two segments; and the nucleus has two cells. There are three species, only one of them, *viz.* the strumarium, or lesser burdock, a native of Britain.

XANTUM, a province of China, in Asia, bounded by the Kang sea on the north, by the gulf of Nankin on the east, by the province of Nankin on the south, and by the province of Pekin on the west.

St. XAVIER, a town of the province of La Plata, or Guayra, in South America, situated on the confines of Brasil,

ſil, two hundred miles weſt of Rio Janeiro: W. long. 50°, S. lat. 24°.

XENSI a province of China, bounded by the great wall on the north, by the province of Xanſi on the eaſt, by the province of Suchuen on the ſouth, and by Tibet on the weſt.

XERANTHEMUM, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is paleaceous; the pappus is ſetaceous; and the calix is imbricated, and radiated. There are eleven ſpecies, none of them natives of Britain.

XEROPHAGIA, in church-hiſtory, the eating of dried foods: ſo the ancient Chriſtians called certain faſt-days, on which they eat nothing but bread and ſalt, and drank only water: ſometimes they added pulſe, herbs, and fruits. This ſort of faſting was obſerved chiefly in the holy-week, out of devotion, and not by obligation.

XICHU, a city of China, in the province of Huguam: E. long. 112°, N lat. 27°.

XINYAN, a city of Aſia, in the province of Laotung: E. long. 120°, N lat 31°.

XIPHIAS, in ichthyology, a genus belonging to the order of apodes. The upper jaw terminates in a long ſword-ſhaped roſtrum; from which it is called the ſword-fiſh: there are no teeth in the mouth; the gill-membrane has eight rays; and the body is ſomewhat cylindrical. There is but one ſpecies, found in the European ocean.

XIPHOIDES, in anatomy. See Anatomy, p. 175.

XYLO-ALOES, or Aloe-wood, in pharmacy. See *Aloe*.

This drug is diſtinguiſhed into three ſorts, the calambac, the common lignum aloes, and calambour.

The calambac, or fineſt aloes-wood, called by authors lignum aloes præſtantiſſimum, and by the Chineſe ſuk hiang, is the moſt reſinous of all the woods we are acquainted with: it is of a light ſpongy texture, very porous, and its pores ſo filled up with a ſoft and fragrant reſin, that the whole may be preſſed and dented by the fingers like wax, or moulded about by chewing in the mouth, in the manner of maſtich. This kind, laid on the fire, melts in great parts like reſin, and burns away in a few moments, with a bright flame and perfumed ſmell. Its ſcent, while in the maſs, is very fragrant and agreeable; and its taſte acrid and bitteriſh, but very aromatic and agreeable: it is ſo variable in its colour, that ſome have divided it into three kinds, the one variegated with black and purple; the ſecond, with the ſame black, but with yellowiſh inſtead of purple; and the third, yellow alone, like the yolk of an egg: this laſt is the leaſt ſcented of the three: the ſubſtance however, in them all, is the ſame in every reſpect, except their colour It is brought from Cochinchina.

The lignum aloes vulgare is the ſecond in value. This is of a more denſe and compact texture, and conſequently leſs reſinous than the other; there is ſome of it, however, that is ſpongy, and has the holes filled up with the right reſinous matter; and all of it, when good, has veins of the ſame reſin in it. We meet with it in ſmall fragments, which have been cut and ſplit from larger; theſe are of a tolerably denſe texture in the more ſolid pieces, and of a duſky brown colour, variegated with reſinous black veins. It is in this ſtate very heavy, and leſs fragrant than in thoſe pieces which ſhew a multitude of little holes, filled up with the ſame blackiſh matter that forms the veins in others. The woody part of theſe laſt pieces is ſomewhat darker than the other, and is not unfrequently purpliſh, or even blackiſh. The ſmell of the common aloe-wood is very agreeable, but not ſo ſtrongly perfumed as the former. Its taſte is ſomewhat bitter and acrid, but very aromatic. This wood is alſo brought from Cochinchina, and ſometimes from Sumatra.

The calambour, or, as ſome write it, calambouc is alſo called agallochum ſylveſtre, and lignum aloes mexicanum It is a light and friable wood, of a duſky and often mottled colour, between a duſky green black, and a deep brown. Its ſmell is fragrant and agreeable, but much leſs ſweet than that of either of the others; and its taſte bitteriſh, but not ſo much acrid or aromatic as either of the two former. We meet with this very frequent, and in large logs; and theſe ſometimes entire, ſometimes only the heart of the tree, the cortical part being ſeparated. This is brought from the iſland of Timor, and is the aloe-wood uſed by the cabinet-makers and inlayers

The Indians uſe the calambac by way of incenſe, burning ſmall pieces of it in the temples of their gods; and ſometimes their great people burn it in their houſes, in times of feaſting. It is eſteemed a cordial, taken inwardly; and they ſometimes give it in diſorders of the ſtomach and bowels, and to deſtroy worms. A very fragrant oil may be procured from it, by diſtillation; which is recommended in paralytic caſes, from five to fifteen drops. It is at preſent, however, but little uſed; and would ſcarce be met with any where in the ſhops, but that it is an ingredient in ſome of the old compoſitions

XYLO-BALSAMUM, a name which naturaliſts give to the wood of the tree which yields that precious gum known to the Latins by the name of opobalſamum, and to us by the balm of Gilead. See Balsam.

We have branches of this tree brought us from Cairo: they are very ſtrait, brittle, unequal, and full of knots; their bark reddiſh without, and greeniſh within. The xylo-balſamum is reputed good to ſtrengthen the brain and ſtomach, and to expel poiſon.

XYLOCASIA, in the materia medica, the ſame with the caſſia ligna. See Cassia.

XYLON, the prickly cotton-tree, in botany, a genus of the polyandria monogynia claſs of plants, the corolla whereof conſiſts of a ſingle petal, divided into five oval, hollow, patent ſegments; the fruit is a large, oblong, turbinated capſule, formed of five woody valves, and containing five cells; the ſeeds are roundiſh, and fixed to a columnar pentagonal receptacle, and have a quantity of fine down, or cotton, adhering to them.

XYNOECIA, in Grecian antiquity, an anniverſary feaſt, obſerved by the Athenians, in honour of Minerva, upon the ſixteenth of Hecatombæon, in memory that, by the perſuaſion of Theſeus, they left their country-ſeats, in which they lay diſperſed here and there in Attica, and united together in one body.

XYRIS, in botany, a genus of the triandria monogynia claſs. The corolla conſiſts of three equal crepated petals; and the gluma conſiſts of two valves. There is but one ſpecies, a native of India.

XYSTARCHA, in antiquity, the maſter or director of the xyſtus. In the Greek gymnaſium, the xyſtarcha was the ſecond

second officer, and the gymnasiarcha the first; the former was his lieutenant, and presided over the two xysti, and all exercises of the athletæ therein.

XYSTUS, among the Greeks, was a long portico, open or covered at the top, where the athletæ practised wrestling and running: the gladiators, who practised therein, were called xystici.

Among the Romans, the xystus was only an alley, or double row of trees, meeting like an arbour, and forming a shade to walk under.

Y.

YACHT, or YATCH, a vessel with one deck, carrying from four to twelve guns. See SHIP.

YARD, a measure of length used in Britain and Spain, consisting of three feet, chiefly to measure cloth, stuffs, *&c.*

YARD, in anatomy. See ANATOMY, p. 270.

YARDS *of a ship*, are those long pieces of timber which are made a little tapering at each end, and are fitted athwart its proper mast, with the sails made fast to them, so as to be hoisted up, or lowered down, as occasion serves. They have their names from the masts unto which they belong.

YARD-ARM is that half of the yard that is on either side of the mast, when it lies athwart the ship.

YARDS also denote places belonging to the navy, where the ships of war, *&c.* are laid up in harbour. There are, belonging to his majesty's navy, six great yards, *viz.* Chatham, Deptford, Woolwich, Portsmouth, Sheerness, and Plymouth: these yards are fitted with several docks, wharfs, lanches, and graving places for the building, repairing, and cleaning of his majesty's ships; and therein are lodged great quantities of timber, masts, planks, anchors, and other materials: there are also convenient store-houses in each yard, in which are laid up vast quantities of cables, rigging, sails, blocks, and all other sorts of stores needful for the royal navy.

YARE, among sailors, implies ready or quick: as, be yare at the helm; that is, be quick, ready, and expeditious at the helm. It is sometimes also used for bright by seamen: as, to keep his arms yare; that is, to keep them clean and bright.

YARE, a river of Norfolk, which runs from west to east, through that country, passing by Norwich, and falling into the German sea at Yarmouth.

YARMOUTH, a borough and port town of Norfolk, situated on the German-sea, at the mouth of the river Yare, twenty miles east of Norwich. It sends two members to parliament.

YARMOUTH is also a borough-town of the Isle of Wight, in Hampshire, situated on the north-west coast of the Island, six miles west of Newport. It sends two members to parliament.

YARN, wool or flax spun into thread, of which they weave cloth. See CLOTH.

YARUM, a market-town of the north riding of Yorkshire, situated on the river Tees, thirty miles north of York.

YAWNING, an involuntary opening of the mouth, occasioned by a vapour or ventosity endeavouring to escape, and generally witnessing an irksome weariness, or an inclination to sleep. Yawning, according to Boerhaave, is performed by expanding at one and the same time all the muscles capable of spontaneous motion; by greatly extending the lungs; by drawing in gradually and slowly a large quantity of air; and gradually and slowly breathing it out, after it has been retained for some time, and rarified; and then restoring the muscles to their natural state. Hence the effect of yawning is to move, accelerate, and equally distribute all the humours through all the vessels of the body, and consequently to qualify the muscles and organs of sensation for their various functions.

Sanctorius observes, that a great deal is insensibly discharged, when nature endeavours to get rid of the retained perspirable matter, by yawning and stretching of the limbs. To these a person is most inclined just after sleep, because, a greater quantity going off by the pores of the skin than at other times, whensoever a person wakes, the increased contraction that then happens closes a great deal of the perspirable matter in the cutaneous passages, which will continually give such irritations as excite yawning and stretching; and such motions, by shaking the membranes of the whole body, and shifting the contacts of their fibres, and the inclosed matter, by degrees throw it off. Hence we see the reason why healthful strong people are most inclined to such motions, because they perspire most in time of sleep, and therefore have more of the perspirable matter to lodge in the pores, and greater irritations thereunto.

YAWS, in the sea language. A ship is said to make yaws, when she does not steer steady, but goes in and out when there is a stiff gale.

YAWS, a distemper endemial to Guinea and the hotter climates in Africa. See MEDICINE, p. 137.

YEAR. See ASTRONOMY, p. 489.

YEAR *and Day* in Scots law. See LAW, Tit. vi. 21, 22.

YELLOW, one of the original colours of light.

YELLOWS, a disease in a horse, much the same with that called the jaundice in man. See FARRIERY, p. 561.

YELLOW-HAMMER, in ornithology. See FRINGILLA.

YEOMAN, the first or highest degree among the plebeians of England, next in order to the gentry.

The Yeomen are properly freeholders, who having land of their own, live on good husbandry.

YEOMAN is also a title of office in the king's household, of a middle place or rank between an usher and a groom.

YEOMAN

YEOMEN *of the guard* were anciently two hundred and fifty men of the beſt rank under gentry, and of larger ſtature than ordinary, each being required to be ſix feet high.

At preſent there are but one hundred yeomen in conſtant duty, and ſeventy more not in duty; and as any of the hundred dies, his place is ſupplied out of the ſeventy.

They go dreſſed after the manner of king Henry VIII's time. They formerly had diet as well as wages when in waiting, but this was taken off in the reign of queen Anne.

YEOVIL, a market-town of Somerſetſhire, ſituated eighteen miles ſouth of Wells.

YEST, a head or ſcum riſing upon beer or ale, while working or fermenting in the vat. See BREWING.

It is uſed for a leaven or forment in the baking of bread, as ſerving to ſwell or puff it up very conſiderably in a little time, and to make it much lighter, ſofter, and more delicate.

YEW, in botany. See TAXUS.

YLA, one of the weſtern iſlands of Scotland, ſituated in the Iriſh-ſea, weſt of Cantire.

YNCA, an appellation anciently given to the kings of Peru, and the princes of their blood; the word literally ſignifying lord, king, emperor, and royal blood.

YOAK, or YOKE, in agriculture, a frame of wood, fitted over the necks of oxen, whereby they are coupled together, and harneſſed to the plough.

YOAK *of land* in our ancient cuſtoms, was the ſpace which a yoke of oxen, that is, two oxen, may plow in one day.

Sea YOAK. When the ſea is ſo rough that the helm cannot be governed by the hands, the ſeamen make a yoak to ſteer by; that is, they fix two blocks to the end of the helm, and reeving two ſmall ropes through them, which they call falls, by having ſome men at each tackle, they govern the helm by direction. They have another way of making a ſea yoak, by taking a double turn about the end of the helm with a ſingle rope, the ends being laid to the ſhip's ſides, by means whereof they guide the helm.

YOANGFU, a city of China, in the province of Huguam, ſituated on the river Kiam E. long. 114°, N. lat. 30° 40′.

YOLK, the yellow part in the middle of an egg. See EGG.

YONNE, a river in France, which riſing in Burgundy, and running north through Nivernois and Champaign, falls into the Seyne at Monterau ſur Yonne.

YORK, the capital city of Yorkſhire, ſituated on the river Ouſe, 180 miles north of London: W. long. 50′, N. lat. 54°. It is a large city, and has ſome good buildings in it, particularly the cathedral, which is a Gothic pile, equal to any thing of the kind in England. It is the ſee of an archbiſhop, and ſends two members to parliament.

New YORK, one of the Britiſh colonies in North America, which comprehending the Jerſeys, that frequently have the ſame governor, is ſituated between 72° and 74° of W. long. and between 41° and 44° of N. lat. bounded by Canada on the north, New England on the eaſt, the American Sea on the ſouth, and Penſilvania and the country of the Iroquois on the weſt.

New YORK, the capital city of this province, is ſituated on an iſland in the mouth of Hudſon's river, in W. lon. 72° 30′, N. lat. 41°.

YUCCA, in botany, a genus of the hexandria monogynia claſs. The corolla is open and bell-ſhaped; it has no ſtylus; and the capſule has three cells. There are four ſpecies, all natives of America.

A kind of bread is made from the dried root of this plant by the Indians, which much reſembles that made from the root of the caſſida or ſcutellaria of Linnæus.

Z.

ZAARA, one of the diviſions of Africa, ſituated under the tropic of cancer, is bounded by Bildulgerid on the north, by the unknown parts of Africa on the eaſt, by Nigritia or Negroland on the ſouth, and by the Atlantic ocean on the weſt. This is a barren deſart, and ſo deſtitute of water, that the camels which paſs over it from Morocco to traffic with Negroland, are half loaded with water and proviſions.

ZAFFER, or ZAFRE, in chemiſtry, the name of a blue ſubſtance, of the hardneſs and form of a ſtone; and generally ſuppoſed to be a native foſſil.

It is in reality, however, a preparation of cobalt; the calx of that mineral being mixed with powdered flints and wetted with water to bring it into this form.

ZAMORA, a city of Spain, in the province of Leon, ſituated on the river Douro, thirty-two miles north of Salamanca: W. long. 6°, N. lat. 41° 30′.

ZANGUEBAR, a country on the eaſt coaſt of Africa, ſituated in ſouthern latitude between the equator and the tropic of capricorn, being bounded by the country of Anian on the north, by the Indian ocean on the weſt, by Caffraria on the ſouth, and by the unknown parts of Africa on the weſt.

ZANNICHELLIA, in botany, a genus of the monœcia monandria claſs. The male has neither calix nor corolla. The calix of the female conſiſts of one leaf; it has no corolla; and there are four germina, and as many ſeeds. There is but one ſpecies, *viz.* the paluſtris, or horned pond-weed, a native of Britain.

ZANONIA, in botany, a genus of the diœcia pentandria claſs. The calix of both male and female conſiſts of three leaves, and the corolla of five ſegments; the female has three ſtyli; and the berry contains two ſeeds. There is but one ſpecies, a native of Malabar.

ZANTE, an island in the Mediterranean sea, situated E. long. 21° 30′, N. lat. 37° 50′, being about twenty four miles long, and twelve broad. The chief town is Zant, and is situated on the east side of the island, being well fortified and defended by a castle.

ZAPATA, a kind of feast or ceremony held in Italy, in the courts of certain princes, on St Nicholas's day; wherein people hide presents in the shoes or slippers of those they would do honour to, in such a manner as may surprise them on the morrow when they come to dress; being done in imitation of the practice of St Nicholas, who used in the night-time to throw purses of money in at the windows, to marry poor maids withal.

ZARA, a city of Dalmatia, situated on the gulph of Venice: E. long. 17°, N. lat. 44°.

ZARNAW, a city of Poland, in the province of Little Poland and palatinate of Sandomir, situated E. long 20°, N lat. 51° 30′.

ZEA, INDIAN CORN, in botany, a genus of the monoecia triandria class. The calix of the male is a double flowered glume, without any awn; the corolla is likewise a glume, without any awn; the calix and corolla of the male consists each of two valves; the stylus is filiform, and pendulous; and the seeds are solitary, being sunk in an oblong receptacle. There is but one species, a native of America.

ZEAL, the exercise of a warm animated affection, or passion, for any thing.

ZEALAND the chief of the Danish islands, is situated at the entrance of the Baltic-sea, bounded by the Schaggerrac-sea on the north; by the Sound, which separates it from Schonen, on the east; by the Baltic-sea, on the south; and by the strait called the Great Belt, which separates it from the island of Funen, on the west; being of a round figure. near two hundred miles in circumference: the chief town is Copenhagen.

ZEALAND, is also a province of the United Netherlands, consisting of eight islands, which lie in the mouth of the river Scheld, bounded by the province of Holland, from which they are separated by a narrow channel, on the north; by Brabant, on the east; by Flanders, from which they are separated by one of the branches of the Scheld, on the south; and by the German ocean, on the west.

ZEALOTS, an ancient sect of the Jews, so called from their pretended zeal for God's law, and the honour of religion.

ZEBRA, in zoology. See EQUUS

ZECHARIAH, a canonical book of the Old Testament, containing the predictions of Zechariah, the son of Barachia, and grandson of Iddo. He is the eleventh of the twelve lesser prophets. Zechariah entered upon the prophetic office at the same time with Haggai, and was sent to the Jews upon the same message, to reprove them for their backwardness in erecting the temple, and restoring divine worship; but especially for the disorder of their lives and manners, which could not but derive a curse upon them. By several notable visions and types, he endeavours to confirm their faith, and establish their assurance concerning God's providence with them, and care over them; and as a proof and demonstration of this, he intersperses the most comfortable promises of the coming of the kingdom, the temple, the priesthood the victory, the glory of Christ the Branch. Nor does he forget to assure them of the ruin of Babylon, their most implacable enemy. This prophet is the longest and most obscure of all the lesser prophets, his style being interrupted and without connection.

ZEDOARY, in the materia medica, a root, the several pieces of which differ so much from one another in shape, that they have been divided into two kinds, as if two different things, under the names of the long and round zedoary, being only the several parts of the same root.

Zedoary is to be chosen fresh, sound, and hard, in large pieces; it matters not as to shape, whether long or round; of a smooth surface, and of a sort of fatty appearance within, too hard to be bitten by the teeth, and of the briskest smell that may be; such as is friable, dusty, and worm eaten, is to be rejected.

Zedoary, both of the long and round kind, is brought us from China; and we find by the Arabians, that they also had it from the same place. The round tubera are less frequent than the long, and some of them have therefore supposed them the produce of a different and more rare plant; but this is not so probable as that the general form of the root is long, and the round tubera are only lusus naturæ, and less frequent in it.

Zedoary, distilled with common water, affords a thick and dense essential oil, which soon concretes of itself into a kind of camphor, and on this oil its virtues principally depend. It is a sudorific, and is much recommended by some in fevers, especially of the malignant kinds. It is also given with success as an expectorant in all disorders of the breast, arising from a tough phlegm, which it powerfully incides and attenuates; it is also good against flatulences, and in the cholic; it strengthens the stomach, and assists digestion; and, finally, is given with success in nervous cases of all kinds.

ZELL, a city of Germany, in the circle of Lower Saxony, capital of the duchies of Zell and Lunenburg, situated at the confluence of the rivers Aller and Fuhse, thirty miles north of Hanover, and forty south of Lunenburg: E long. 10°, N. lat. 52° 52′.

ZEND, or ZENDAVESTA, a book containing the religion of the Magians, or worshippers of fire, who were disciples of the famous Zoroaster. See MAGI.

This book was composed by Zoroaster during his retirement in a cave, and contained all the pretended revelations of that impostor. The first part contains the liturgy of the magi, which is used among them in all their oratories and fire-temples to this day; they reverence it as the Christians do the Bible, and the Mahometans the Koran. There are found many things in the zend taken out of the scriptures of the Old Testament, which Dr. Prideaux thinks is an argument that Zoroaster was originally a Jew. Great part of the Psalms of David are inserted: he makes Adam and Eve to have been the first parents of mankind, and gives the same history of the creation and deluge as Moses does, and commands the same observances about clean and unclean beasts, the same law of paying tythes to the sacerdotal order, with many other institutions of Jewish extraction. The rest of its contents are an historical account of the life, actions, and prophecies of its author, with rules and exhortations to moral living. The Mahometans have a sect which they call Zendikites, who are said to be the Sadducees of Mahometanism, denying providence and the resurrection, believing

lieving the transmigration of souls, and following the zend of the magi.

ZENITH, in astronomy, the vertical point; or a point in the heavens directly over our heads.

ZEPHANIAH, a canonical book of the Old Testament, containing the predictions of Zephaniah the son of Cushi, and grandson of Gedaliah; being the ninth of the twelve lesser prophets. He prophesied in the time of king Josiah, a little after the captivity of the ten tribes, and before that of Judah; so that he was co-temporary with Jeremiah. He freely publishes to the Jews, that what increased the divine wrath against them, was their contempt of God's service, their apostacy, their treachery, their idolatry, their violence and rapine, and other enormities: such high provocations as these rendered their destruction terrible, universal, and unavoidable: and then, as most of the prophets do, he mingles exhortations with repentance, as the only expedient in these circumstances.

ZEPHYR, the west wind, or that which blows from the cardinal point of the horizon opposite to the east.

ZEST, the woody thick skin, quartering the kernel of a walnut; prescribed by some physicians, when dried and taken with white-wine, as a remedy against the gravel.

ZETETIC METHOD, in mathematics, the method made use of to investigate or solve a problem.

ZEUGMA, a figure in grammar, whereby an adjective or verb which agrees with a nearer word, is also, by way of supplement, referred to another more remote.

ZEUS, in ichthyology, a genus belonging to the order of thoracici. The head is compressed, and declines, the upper lip being vaulted over by a transverse membrane; the tongue is subulated; there are seven rays in the gill-membrane; and the body is compressed. The species are four, distinguished by the shape of their tails.

ZEBETHICUS, in zoology. See CASTOR.

ZINGIBER, in botany. See AMOMUM.

ZINK. See CHEMISTRY, p. 90, 106, 143.

ZINZIBER, or ZINGIBER, GINGER, in botany, the naked stalked oval spiked amomum. See AMOMUM, and GINGER.

ZIRANIA, in botany a genus of the monoecia hexandria class. The male has no calix; the corolla consists of a double valved glume without any awn. The female has no calix; the corolla consists of a single-valved guma with an awn; the stylus is bifid; and there is but one seed. The species are two, none of them natives of Britain.

ZIZIPHORA, in botany, a genus of the diandria monogynia class. The corolla is ringent the superior labium being reflected and entire; the calix is filiform; and there are four seeds. The species are four, none of them natives of Britain.

ZODIAC in astronomy, a fascia or broad circle, whose middle is the ecliptic and its extremes two circles parallel thereto, at such a distance from it as to bound or comprehend the excursions of the sun and planets See ASTRONOMY.

ZOLLERN, a city of Germany, in the circle of Swabia, capital of the county of Zollern, and subject to its count: situated E. long. 8° 55′, N. lat. 48° 18′.

ZONE, in geography and astronomy, a division of the terraqueous globe, with respect to the different degrees of heat found in the different parts thereof. See GEOGRAPHY.

ZOOLOGY, the science of animals. See NATURAL HISTORY.

ZOOPHIT, in natural history, a kind of intermediate body, partaking of the nature of a sensitive and a vegetable. See NATURAL HISTORY.

ZOOTOMY, the art of dissecting animals or living creatures, being the same with anatomy. See ANATOMY.

ZUG, one of the cantons of Switzerland, is surrounded by the cantons of Lucern, Zurich, and Switz; and is eighteen miles long, and seven broad.

ZUINGLIANS, a branch of the ancient Christian reformers, or protestants; so called from their author Huldric Zuinglius, a divine of Switzerland, who soon after Luther had declared against the church of Rome; and being then minister of the church at Zurich, fell in with him, and preached openly against indulgences, the mass, the celibacy of the cergy, *&c.* What he differed from Luther in, concerned the eucharist: for interpreting *hoc est corpus meum*, by *hoc significat corpus meum*, he maintained that the bread and wine were only significations of the body and blood of Jesus Christ; whereas Luther held a consubstantiation.

ZURICH, a canton of Switzerland, bounded by the canton of Schaffhausen on the north, by the canton of Appenzel on the east, by Zug and Switz on the south, and by Bern and Lucern on the west; being fifty miles long, and forty broad. Zurich is also the name of the capital city of this canton, situated E. long. 8° 30′, and N. lat. 47° 52′. It is likewise the name of a lake, twenty-four miles long, and three broad; at the south end of which the city of Zurich stands.

ZUTPHEN, a city of a county of the same name, in Gelderland, situated on the river Yssel, fixteen miles north-east of Arnheim: E. long. 6°, N. lat. 52° 15′.

ZUYDERSEE, a great bay of the German ocean, which lies in the middle of the United provinces, having the islands of Texel, Flie, and Schelling, at the entrance of it, on the north; the provinces of Friesland, Overyssel, and Gelderland, on the east; Utrecht, and part of Holland, on the south; and another part of Holland on the west. The chief town is Amsterdam.

ZWEIBRUGGEN, a county of the palatinate of the Rhine, in Germany, subject to the duke of Deuxponts.

ZYGÆNA, in ichthyology. See SQUALUS.

ZYGOMA, in anatomy. See ANATOMY, p. 152.

ZYGOMATICUS, in anatomy. See ANATOMY, p. 306.

ZYGOPHYLLUM, in botany, a genus of the decandria monogynia class. The corolla consists of five leaves and the corolla of five petals; the nectarium consists of ten leaves, covering the germen, and the capsule has five cells. There are 8 species, none of them natives of Britain.

F I N I S.

C O R R I G E N D A.

Page 132. col. 1. l. 25, 26. Inſtead of *from the ſalivary glands, from ſmoking*, &c. read, *as to the ſalivary glands from ſmoking*, &c.

P. 510. col. 2. l. *ult*. For (*ibid.* n° 2.) read (*Plate CXLVII. fig.* 1. *n*° 1.)

METAPHYSICS, l. 10 For *metaphyſics*, read *phyſics*.

P. 588. col. 2. l. *ult*. Inſtead of *which is always really a diphthong*, read, *which is always, when long, really a diphthong*.

P. 590. col. 1. l. 41. For *curve line*, read *curvilineal*.

N O T A N D A

1. In the Table of ERRATA at the end of Vol. I. it was ſaid, "That Plate XLVII. repreſented a different Orrery from the one deſcribed." This was a miſtake the Printer was ſomehow led into: for the Orrery there repreſented is the right one, and correſponds with the deſcription.
2. In FLAX-DRESSING, plans of two machines relating to that article were referred to, but which ſeveral circumſtances now render it difficult for the Editors to give. It is therefore hoped theſe will be diſpenſed with, as they are not of the moſt general importance, and the article is ſufficiently explained and illuſtrated without them; and eſpecially as 10 plates more than the propoſed number, and 16 pages of letter-preſs, are given gratis.

D I R E C T I O N S to the B I N D E R.

1. Be careful in cutting the book, not to pare too much off the margin; as it was neceſſary, in ſeveral places, particularly in BOOK-KEEPING, to enlarge the page beyond the meaſure of the reſt of the book.
2. Title-pages for the Three Volumes are printed. Place them reſpectively at the beginning of the Volume; and after the title in Vol. I. inſert the Preface.
3. In BOOK-KEEPING, Vol. I. cancel pages 585, 586; and in their place inſert the leaves marked with an aſteriſk and incloſed with parentheſis, *viz*. (*585) (*586), (*A) (*A), (*B) (*B), (*C) (*C), (*D) (*D), (*E) (*E).
4. Inſert the Plates as directed below.

Plate	[Vol. I.]	Page	Plate	[Vol. I.]	Page	Plate	[Vol. II.]	Page	Plates	[Vol. III.]	Page
1	to face	14	42	to face	457	81	to face	598	120		
2	— — —	17	43	— — —	468	82	— — —	604	121		
3	— — —	27	44	— — —	472	83	— — —	617	122		
4	— — —	41	45	— — —	475	84	— — —	620	123		
5	— — —	43	46	— — —	477	85	— — —	621	124		
6	— — —	44	47	— — —	496	86	— — —	667	125		
7	— — —	45	48	— — —	497	87	— — —	671	126		
8	— — —	56	49	— — —	499	88			127	to face	35[illegible]
9	— — —	68	50	— — —	500	89			128		
10	— — —	77	51	— — —	515	90	— — —	682	129		
11	— — —	127	52	— — —	624	91			130		
12	— — —	144	53	— — —	635	92			131		
13	— — —	189	54	— — —	637	93	— — —	685	132		
14	— — —	190	55	— — —	639	94	— — —	690	133		
15	— — —	224	56	— — —	640	95	— — —	693	134	— — —	377
16	— — —	225	57	— — —	641	96	— — —	697	135	— — —	390
17	— — —	246	58	— — —	642	97	— — —	717	136		
18	— — —	254		Vol. II.		98	— — —	756	137		
19	— — —	281				99	— — —	804	138		
20	— — —	283	59	to face	11	100	— — —	816	139	— — —	440
21	— — —	309	60	— — —	16	101	— — —	819	140		
22	— — —	331	61	— — —	22	102	— — —	858	141		
23	— — —	336	62	— — —	24	103	— — —	880	142	— — —	476
24	— — —	351	63	— — —	30	104	— — —	968	143	— — —	472
25			64	— — —	1[illegible]7		Vol. III.		144		
26			65	— — —	167				145	— — —	[illegible]
27			66	— —	218	105	to face	38	146	— — —	[illegible]
28	— — —	352	67	— —	270	106	— — —	42	147	— — —	512
29			68	— —	414	107	— — —	46	148	— — —	5[illegible]3
30		354	69	— —	422	108	— — —	50	149		
31	— — —	357	70	— —	4[illegible]6	109	— — —	56	150		
32	— — —	358	71	— —	428	110	— — —	175	151	— — —	592
33	— — —	359	72	— — —	440	111	— — —	206	152		
34			73	— — —	475	112	— — —	215	153		
35	— — —	360	74	— — —	477	113	— — —	22[illegible]	154	— — —	598
36			75	— — —	506	114			155		
37	— — —	361	76	— — —	540	115	— — —	316	156	— — —	613
38	— — —	425	77	— — —	541	116			157	— — —	678
39	— — —	444	78	— — —	583	117			158		
40	— — —	449	79	— — —	585	118	— — —	332	159	— — —	912
41	— — —	451	80	— — —	556	119			160	— — —	916